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ARIZONA
DEPARTMENT OF TRANSPORTATION

Draft Final Drainage Report I-10 Outside Widening Sarival Avenue to Dysart Road

ECS Contract No. 06-44
TRACS No. H7296 01C

PREPARED BY:

URS

7720 NORTH 16TH STREET, SUITE 100
PHOENIX, ARIZONA 85020
602-371-1100

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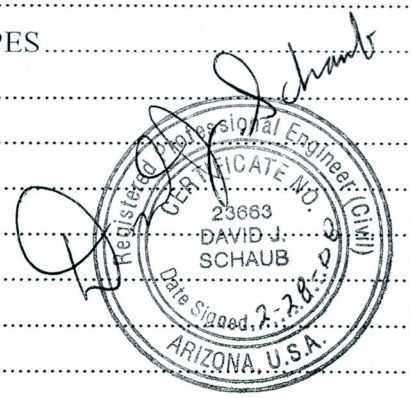

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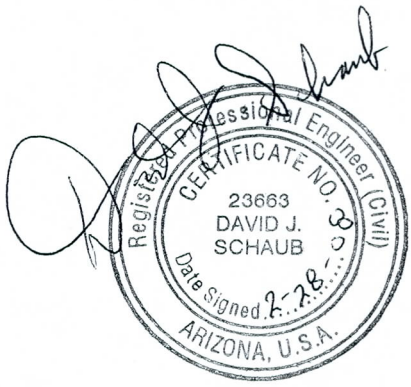

1.0 INTRODUCTION

1.1 BACKGROUND AND SCOPE

The purpose of this Draft Final Drainage Report is to document the engineering analyses utilized for the Stage III design of drainage facilities for the I-10 Outside Widening from Sarival Avenue east to Dysart Road. The project location is shown on Figure 1.1, Project Location Map. The project is located within Goodyear, however the east half of Dysart Road TI is located within the City of Avondale in Maricopa County, Arizona. The project begins at Milepost (MP) 126.03 and extends east to MP 130.34, approximately 4.31 miles, as shown on Figure 1.2, Project Vicinity Map.

The purpose of the project is to reduce congestion, improve access to employment centers, and enhance regional mobility of goods and services by increasing the capacity of this segment of the I-10 west corridor. The I-10 west corridor is above ground for the entire project. Grade separation bridge structures occur at Estrella Parkway, Bullard Avenue, Union Pacific and Southern Pacific Railroad, Litchfield Road, and Dysart Road.

Interstate 10 (Papago Freeway) is a major element of the Maricopa Association of Governments (MAG) adopted Regional Freeway System in the central portion of Maricopa County. Rapid development within this area is increasing congestion along the I-10 west corridor. Traffic projections indicate future traffic volumes will further congest the facility. The Outside Widening project of I-10 will add a general purpose lane and auxiliary lanes from Sarival Avenue to Dysart Road. The proposed improvements coupled with the earlier median widening project will provide a continuous 4+1 roadway section, four general purpose lanes plus one high-occupancy vehicle (HOV) lane in each direction, from approximately 1,700 feet east of Sarival Avenue east to State Route (SR) 101L.

The hydrologic and hydraulic analyses use procedures and methodologies presented in the Arizona Department of Transportation (ADOT) *Highway Drainage Design Manual – Hydrology* (HDDM), the ADOT *Highway Drainage Design Manual-Hydraulics*, and the ADOT *Roadway Design Guidelines* (RDG).

The I-10 west corridor is shown as a Class 1 roadway on the ADOT Operation Drainage Frequency Classes map. The ADOT pavement drainage design criterion is the 10-year storm event.

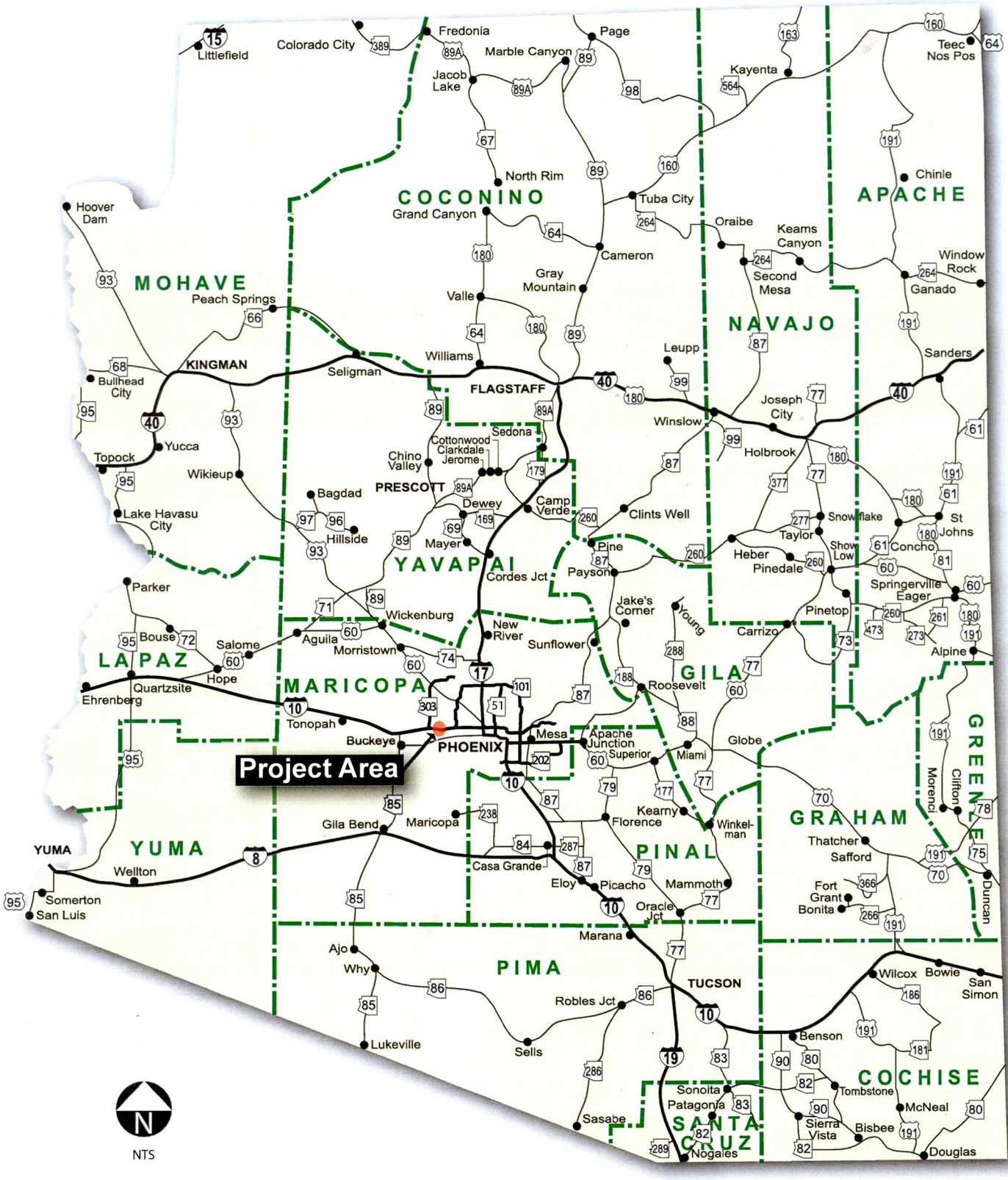

Figure 1.1

Project Location Map

I-10 Outside Widening Sarival Avenue to Dysart Road

ADOT

URS

Figure 1.2
Project Vicinity Map

1.2 DESIGN CONSTRAINTS AND OPPORTUNITIES

The I-10 outside widening project will add one general-purpose lane and auxiliary lanes to the outside of the existing travel lanes from east of Sarival Avenue to east of Dysart Road. The proposed improvements coupled with the recent median widening project will provide a continuous four general-purpose lanes plus one high-occupancy vehicle (HOV) lane in each direction from Sarival Avenue to SR 101L.

Off-site drainage analysis is not required for the outside widening project. Two off-site cross flow facilities are located at Station 6653+00, at the Canyons Trails Subdivision, and at Station 6708+50, Bullard Wash Bridge. The first crossing will be modified as part of the future Ultimate Widening project, while the second crossing is being implemented as part of the current Median Widening project scheduled for construction this year.

The I-10 Median Widening project included the replacement of asphalt curb and guardrail with temporary concrete barrier with 1-foot (W) by 3-inch (H) drainage slots spaced at 5'-3" or 9'-0" depending on length of barrier. These interim drainage facilities will be replaced as part of the outside widening project.

Retention basins will be required for I-10 onsite runoff at the Estrella Parkway TI. The absence of a viable outfall at the Estrella Parkway/Ramp B intersection will require a new shallow retention basin placed between the south right-of-way and the ramp. This basin will accommodate runoff from Ramp B and its infield area and the adjacent I-10 eastbound lanes. An existing off-site private retention basin located north of I-10 and west of Estrella Parkway will continue to be utilized to retain I-10 runoff. This basin will retain runoff from Ramp A and its infield area and the adjacent I-10 westbound lanes. Coordination with the City of Goodyear is required for the private retention basin. A developer is currently developing improvement plans for the land that this retention basin is located on.

New drainage ditches in combination with some closed conduit systems will be constructed along the north and south sides of I-10 between Estrella Parkway and Bullard Avenue traffic interchanges to collect and carry roadway runoff to Bullard Wash.

Existing Flood Control District of Maricopa County (FCDMC) regional retention basins (formerly ADOT basins) located to the north of I-10 between Bullard Avenue and Dysart Road interchanges will be utilized for point of discharge from this segment of I-10 westbound and portions of I-10 eastbound on-site runoff. New storm drains will be extended to the bottom of the basins to eliminate bank erosion, which is occurring with the present drainage system.

Nine new retaining walls will require drainage swales on the roadway side to collect on-site drainage. Special inlet structures will be installed at the walls to collect and convey runoff to the downstream side of the walls. Riprap spillways will be placed at the outlets of the retaining walls where needed.

The storage in the existing retention basins at Bullard Avenue traffic interchange will be evaluated and reconfigured as necessary, to meet any increase in roadway runoff. The supporting computations for the resizing of the retention basins will be included in the Final Drainage Report submittal.

Because of the increase in roadway runoff from this project and concern about potential impact to adjacent private development, the future retention basins along the south side of I-10 between Litchfield Road and Dysart Road interchanges will be implemented with this project. Layout of the basins will be developed to minimize the removal of existing native trees located within the right-of-way. The retention basins will also be designed with adequate storage to meet ultimate roadway conditions.

The existing roadway drainage systems at Litchfield Road and Dysart Road interchanges will be used to convey the runoff from the interchanges to the FCDMC regional retention basins. Hydraulic evaluation of the existing drainage systems will be included in the Final Drainage Report.

A combination drainage ditch and closed conduit drainage system located within and along the south right-of-way will collect runoff from the I-10 eastbound lanes from the east end of Dysart Road interchange to the Aqua Fria River and discharge to the Agua Fria River. A drainage ditch located within and along the north right-of-way will collect runoff from the I-10 westbound lanes along this section of the freeway with discharge to the Agua Fria River.

The five bridges included in this project will be evaluated for meeting ADOT spread criteria in the implementation of deck drains. The Initial Drainage Report identified three bridges with positive drainage problems; the bridges are Estrella Parkway, Bullard Avenue and Dysart Road interchange overpasses. Estrella Parkway and Dysart bridges have minimal longitudinal grades, which may require the installation of a deck drainage system along the outside gutters. The Bullard Avenue Bridge has a sheet flow problem due to a super-elevation transition across the bridge. A separate report has been prepared for ADOT's review and comment. The final memorandum will be included in the Final Drainage Report.

Because the outside widening of the existing bridges includes the widening of the anchor and approach slabs, modifications to existing drainage structures positioned at the ends of the bridges will be required.

The on-site drainage infrastructure for this project, including the on-site conveyance systems, roadside ditches and closed conduit systems and retention basins, will be designed to accommodate the ultimate roadway.

Ultimate widening improvements for I-10 will be constructed for the segment of I-10 from east of Estrella Parkway, at approximately Station 6695+19, to east of Bullard Avenue at approximately Station 6755+00. The on-site infrastructure for the traffic interchanges will be designed to accommodate ultimate widening.

I-10 ultimate widening at the west end of the project will make the area between the south right-of-way and the roadway insufficient to retain the on-site runoff generated from the eastbound lanes of travel. FCDMC owns a parcel on the north side of I-10, west of Estrella Parkway. FCDMC is considering constructing a retention basin to alleviate the flooding in this area currently designated Zone A floodplain. A 42-inch cross pipe has been provided in the I-10 Median Widening project at Station 6664+25 for conveyance of runoff from south right-of-way north to the future retention basin.

1.3 PREVIOUS STUDIES

A Preliminary (30%) Drainage Report was published for this project in May 2007. Reports pertinent to this drainage report are:

- Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, February 2005 by URS.
- Hydrology Re-Evaluation for the Papago Freeway West, Ehrenberg – Phoenix Highway, I-17 to Agua Fria River, January 1978 by ADOT
- Outer Loop/I-10 Interchange at 99th Avenue Drainage Report (June 1991, April 2002 & June 2005), by HDR
- System Analysis and Conceptual Design of Channelization in the Agua Fria River, July 1983, HDR.
- Durango Area Drainage Master Plan, September 2005, Dibble and Associates.
- Buckeye Flood Retarding Structure No. 1 Rehabilitation Project.

- Sun Valley Area Drainage Master Plan (ADMP).
- I-10/Bullard Avenue Drainage Report, February 1989, HNTB.
- Final Drainage Report for Interstate 10/Bullard Avenue Traffic Interchange, February 2006.
- Final Drainage Report for I-10 Median Widening, Sarival Avenue to SR 101L, March 2007.

As-Built plans pertinent to this project are:

- I-10-2 (34) Grading, Pavement, Drainage & Bridges, Perryville Road to Bullard Wash, September 19, 1985.
- I-10-2 (84) PCC Paving Plans, Dysart Road to 99th Avenue, August 20, 1990.
- I-10-2 (75) Grading and Drainage, Agua Fria to 115th Avenue, March 28, 1984.
- I-10-2 (70) Grading Drainage & Bridges, 115th Avenue to 95th Avenue, June 18, 1986.
- I-10-2-525, Agua Fria Bridge Repair, May 17, 1999.

Current construction plans pertinent to this project are:

- I-10/Bullard Avenue Traffic Interchange, Project No. 010-B(007)B H6780 01C, January 29, 2007.
- I-10 (Papago) Median Widening, Sarival Avenue to SR101L, Project No. 010 MA 126 H7096 01C, Federal Aid No. 010-B(201)N, October 9, 2007.

Both of these projects are currently under construction.

Portions of these plans that relate to on-site and off-site drainage are included in Appendix J.

2.0 SITE DESCRIPTION

2.1 TOPOGRAPHY

The general topography to the north of I-10 and west of the Agua Fria River slopes towards the southeast, with the exception of the Bullard Wash crossing. South of I-10, the topography has a gradual southern slope towards the Gila River. I-10 serves as a barrier prohibiting overland flow from crossing the freeway except at locations identified in Table 2.2 and shown on the jurisdiction washes aerial in Appendix L.

2.2 FIELD INVESTIGATIONS

Several field investigations were conducted during the fall of 2007 to verify topographic features and hydrologic parameters. As part of the field review, photographs were taken for each drainage feature showing existing conditions. Representative photos of the existing drainage infrastructure for this segment of I-10 along with appropriate captions are included in Appendix K.

2.3 LAND USE, VEGETATION AND SOIL TYPES

The existing right-of-way is owned by ADOT and reserved for transportation. Adjacent land is a combination of private and municipally owned. Existing land uses adjacent to I-10 from Sarival Avenue to Aqua Fria River include a mixture of single and multi-family residential, commercial, recreational, agricultural and industrial.

Native subsurface soil within this segment of the I-10 corridor is comprised of fine-grained, alluvial soils. Within 50 feet from the existing surface, the soils consist of a mixture of sand, silt and clay with varying amounts of gravel.

2.4 EXISTING UTILITIES

Existing utilities for this segment of I-10 includes ADOT, Arizona Public Service (APS), Arizona Water Company, AT&T, City of Avondale, AZVT LLC, Broadwing Communications, Town of Buckeye, Bureau of Reclamation, Cox Communications, Cricket Communication, El Paso National Gas, City of Goodyear, Green Street Properties, Insight Cable, MCI Telecommunications, City of Phoenix, Qwest, Roadway Electric, Inc. Roosevelt Irrigation District, Salt River Project (SRP), Southwest Gas, Sprint PCS, T-Mobile, City of Tolleson, US Telecom, Velocita Communications, and Western Area Power Administration (WAPA).

A utility inventory was developed for the Design Concept Report (DCR) using information collected from field investigation, Blue Stake ticket requests, ADOT permits, as-built plans, and quarter-section maps. The following tables summarize the existing utilities presented in the DCR for the segment of the I-10 from Sarival Avenue east to Aqua Fria River.

Table 2.1 Summary of Existing Utilities[1]

Location Along I-10	Existing Utility Types
Sarival Avenue to Estella Parkway	Fiber Optics (FO), culverts, storm drain, CATV, traffic signals, waterline, telephone, natural gas, overhead power (24kv), 24" sewer, and underground pipe.
Estella Parkway to Bullard Avenue	FO, electric, culverts, storm drain, unknown conduit, CATV, traffic signals, water, sewer, telephone, natural gas, underground pipe.
Bullard Avenue to Litchfield Road	FO, electric, culverts, storm drain, CATV, traffic signals, irrigation pipe, overhead power (12kv), 12" irrigation pipe, 20" return line, 8" waterline, natural gas, high pressure gas, cellular site, and an underground conduit.
Litchfield Road to Dysart Road	FO, electric, culverts, storm drain, CATV, traffic signals, telephone, natural gas, high pressure gas, street lights, underground conduit, 16" waterline, sewer line, water, and a water main through ADOT property.
Dysart Road to Avondale Boulevard	Pull TI lines through existing conduit, FO, telephone, natural gas, 6", 8", 12" and 48" water lines, 6", 8", 24" and 42" sewer lines, unknown storm drain, elect, irrigation pipe, 8" sewer line, gas main, wireless facility, boring to install fiber optics, cellular site, and a utility agreement-relocated.

[1] Taken from Table 1.2 Existing Utilities, Interstate 1-0 (Papago) Median Widening, Final Design Concept Report, March 2006.

2.5 FLOODPLAIN LOCATIONS

A review of the Federal Emergency Management Agency Flood Insurance Rate Maps for the project site indicates the project is located within portions of a 100-year floodplain.

- 1,700 feet east of Sarival Avenue to Estrella Parkway adjacent to existing north right-of-way line is designated Zone A
- Bullard Wash is designated Zone AE
- Four existing detention basins near Litchfield Road adjacent to existing north right-of-way line is designated Zone AH.

Because the roadway widening continues the existing horizontal and vertical alignment, the roadway does not substantially modify the topography within the project area. Therefore, no impacts to the floodplains are anticipated. Further review of this situation will be evaluated and documented in the Final Drainage Report.

Copies of the floodplain maps pertinent to this project are included in Appendix M. The maps for this segment of the I-10 corridor are dated September 30, 2005. A LOMR issued October 17, 2006 has revised the FIRM map for Bullard Wash as part of the I-10 Median Widening project.

2.6 EXISTING DRAINAGE SYSTEMS

2.6.1 Off-Site Drainage

The general topography north of I-10 from Sarival Avenue east to Aqua Fria River slopes towards the southeast, except between Bullard Wash and Bullard Avenue, which slope to the southwest towards the wash. The I-10 embankment forms a barrier, prohibiting cross flow except at cross culverts, overpasses, major wash crossings, and river crossings.

Several existing storm drain culverts crossing beneath I-10 periodically collect both on-site and off-site drainage from the north and convey it to the south into existing farm fields, private retention basins, ditches or regional retention facilities.

There is a single cross culvert along this section of I-10, located at Station 6653+00. Five 29"x42" horizontal elliptical concrete pipes convey off-site drainage from north to south. The flows discharge unobstructed into a shallow retention basin within I-10 south right-of-way. As ponding depth increases, the flow exits south through an opening in the existing sound wall of the Canyon Trail Subdivision to be retained in a system of existing private retention basins.

Estrella Parkway and Dysart Road I-10 bridges provide corridors for conveyance of off-site drainage from north to south.

Off-site drainage to the north of I-10 between Estrella Parkway and Bullard Avenue is collected in drainage ditches/channels and carried both east and west towards Bullard Wash, which flows south.

There are four regional retention basins located to the north of I-10 near Litchfield Road TI. These basins were built when the original I-10 was constructed to detain regional flows cut off by I-10. The basins were over excavated because they served as a borrow source for roadway embankment. ADOT sold the basins to the FCDMD in 2000. However, ADOT has retained the rights to discharge adjacent freeway right-of-way runoff into the basins. Subsequently, the FCDMD entered into an intergovernmental Agreement (GSA) in 2005 with the cities of Litchfield Park, Avondale and Goodyear for their combined use of these basins. The current General Plan for the City of Goodyear has identified the two westernmost basins as a potential site for a regional park.

Major existing structures carrying off-site flows are summarized in Table 2.2.

Table 2.2 Existing Major Cross Conveyances and Estimated Off-Site Flows[1]

Location	100-year, 24-hour Peak Flow at I-10 to the South	Reference
1-10 at Sta. 6653+00 (East of Sarvial Avenue)	64 cfs/ Five 29"x42" Reinforced Concrete Pipes	Loop 3003/White Tanks ADMP Update
Estrella Parkway	14 cfs/TI Bridge	Loop 3003/White Tanks ADMP Update
Bullard Wash (Sta. 6708+00)	2,249 cfs/Wash Bridge	Loop 3003/White Tanks ADMP Update

[1]Taken from Table1, Preliminary Drainage Report (Stage II), "I-10 (Papago) Median Widening, Sarival Avenue to SR 101L in Maricopa County, Arizona", May 2006.

2.6.2 On-Site Drainage

On-site drainage on I-10 sheet flows off the outside edge of the pavement or is collected in the median catch basins that discharge through lateral pipes to discharge into the freeway off-site drainage systems (FCDMC regional retention basins). The I-10 overpasses includes guardrail with embankment curbs to collect and direct roadway runoff to either down-drains or spillways for discharge to the infield areas.

The following table identifies the existing drainage structures and runoff flow patterns for the existing I-10 mainline within the limits of the project.

Table 2.3 Summary of Existing Drainage Structures and Roadway Runoff Flow Patterns[1]

Begin Approach	End Approach	Northern Runoff (I-10 WB lanes)	Southern Runoff (I-10 EB Lanes)	Existing Drainage Structure
East of Sarival Avenue	West of Estrella Parkway	- Sheet flow except near interchange. - Flows are conveyed along the roadway embankment to 5-29"x43" elliptical culvert passing flows under the freeway. - Runoff discharges south into a detention basin in the Canyon Trails Subdivision. - Estrella Parkway infield areas is drained to north by a culvert under Ramp A.	- Flows are conveyed along the roadway embankment and discharge into detention basins in Canyon Trails Subdivision. - Sheet flow off roadway except at interchange where downdrains are located. - Estrella Parkway infield area is drained to the south by a culvert under Ramp B.	No curb and gutter, except at the Estrella Parkway interchange where catch basins with downdrains are located.
East of Estrella Parkway	West of Bullard Avenue	- Sheet flow except near interchanges. - The Estrella Parkway infield area is drained to the north by a culvert under Ramp C. - Drainage is conveyed along the roadway embankment to Bullard Wash. - Bullard Avenue infield areas have retention basins with runoff retained and infiltrated.	- Sheet flow except near interchanges. - Super elevated areas drain to median barrier and conveyed north and south. - Estrella Parkway infield area is drained to the south by a culvert under Ramp D. - Bullard Avenue infield areas have retention basin with runoff retained and infiltrated.	- No curb and gutter except at east Estrella Parkway interchange and east approach to Bullard Avenue bridge where catch basins with downdrains or spillways are located. - Median catch basins are located along super elevation section of roadway.
East of Bullard Ave.	West of Litchfield Road	- Sheet flow except near interchanges. - Drainage is conveyed along the roadway embankment and flow overland to the FCDMC retention basins. - Bullard Avenue infield areas have retention basins and flows are retained and infiltrated. - Litchfield Road infield areas have catch basins that flow via storm drain to FCDMC regional retention basins.	- Super elevated areas drain to median barrier and conveyed north via pipe and flow along the embankment into the FCDMC basins. - Flows west of Sta. 6750+00 drain via spillway into the Bullard Avenue infield area. - Flows east of Sta. 6769+50 and west of Litchfield Road Ramp D drain via spillways, pond in the right-of-way and sheet flow into open farm fields. - Flows east of Ramp D sheet flow off roadway and conveyed by spillway to the Litchfield infield area catch basin.	- No curb and gutter, except at Bullard Avenue interchange, approaches to SPRR bridge and Litchfield interchange. - Spillways at the interchanges and SPRR bridge. - Bullard Avenue infield areas have retention basins and flow are retained and infiltrated. - Litchfield infield areas have catch basins that flow via storm drain to FCDMC basins.
East of Litchfield Interchange	West Bank of Dysart Road	- Sheet flow except near interchanges. - Drainage is conveyed along the roadway embankment to the FCDMC detention basins.	- Sheet flow expect near interchanges. - Runoff pond in right-of-way and sheet flows to the south. - A portion of the flows outlet via catch basins	- No curb and gutter except at Litchfield and Dysart road interchanges. - Catch basins and downdrains at the interchanges. - Litchfield and Dysart

		- Dysart Road Ramp A infield area has a catch basin that flows via storm drain to the FCDMC basins outlet pipe along Dysart Road.	located at Litchfield Road and Dysart Road interchanges. - Dysart Road Ramp B infield area has catch basin that flow via storm drain to FCDMC basins outlet pipe along Dysart Road.	Road have infield catch basins between ramps and mainline.
East of Dysart Road	West Bank of Aqua Fria River	- Sheet flow except near interchange. - Drainage is conveyed along the roadway embankment to the Aqua Fria River. - Dysart Road Ramp C infield area has catch basins that flow via storm drain to drainage system along Dysart Road with discharge to FCDMC regional retention basins.	- Sheet flow except near interchange. - Drainage is conveyed along the roadway embankment to the Aqua Fria River. - Dysart Road Ramp D infield area has catch basins that flow via storm drain to drainage system along Dysart Road with discharge to FCDMC regional retention basins.	- No curb and Gutter, except at Dysart Road which has downdrains. - Dysart Road interchange has infield catch basins located between ramps and mainline and within north and south right-of-ways.

[1] Taken from Table 1, Preliminary Drainage Report (Stage II), "I-10 (Papago) Outside Widening, Sarival Avenue to Dysart Road in Maricopa County, Arizona", May 2007.

2.7 PROPOSED DRAINAGE SYSTEM

The main intent of the proposed drainage system is to continue to maintain the existing drainage patterns throughout the project.

2.7.1 Design Issues

- On-site drainage design will be performed for this project assuming ultimate widening condition. To minimize future throwaway, the on-site drainage facilities for this project will be designed to be compatible with the ultimate widening condition.
- The I-10 median widening project final design has been completed and it is currently under construction. Compatibility with this project will be considered in extending the existing pipes and the installation of new storm drain systems.
- The removal and replacement of pavement along I-10 will impact some of the existing drainage structures on the outside edges of the I-10 eastbound and westbound lanes. Reconstruction of portions of the existing structures or replacement may be required.
- Outside widening of I-10 will require the re-evaluation of the Bullard Avenue interchange infield retention basins storage needs.

- Roadside ditches and storm drains shall be constructed to direct roadway drainage to the existing off-site cross conveyance locations leaving the right-of-way.

- Nine new retaining walls will require ditches along their roadway side to collect on-site runoff. The drainage systems will be sized to accommodate the ultimate widening. Special drainage structures will be required at several of the retaining walls to collect and convey runoff to the downstream side of the walls.

- Future retention basins along the south side of I-10 between Station 6802+00 and Station 6825+25 will be installed as part of this project. The retention basins will be sized for the I-10 ultimate widening.

- Storm drains discharging into existing FCDMC detention basins will be extended to the bottom of the basins to avoid future bank erosion.

2.7.2 Proposed Off-Site Drainage Conditions

The proposed outside widening of I-10 will contribute additional runoff to the existing off-site drainage infrastructure from the increase in pavement surface. The existing off-site infrastructure will remain, with historic flow pathways being maintained.

The off-site drainage north of I-10 between Sarival Avenue and Estrella Parkway will continue to cross under I-10 through the existing 5-29"x42" elliptical concrete culverts at Station 6653+00.

The north off-site drainage area from east of Estrella Parkway to west of Bullard Avenue will continue to discharge into Bullard Wash. FCDMC is currently implementing improvements, in conjunction with the I-10 Median Widening project, on Bullard Wash upstream of I-10. The I-10 Median Widening project has completed the design of the channelized section of the wash through the proposed bridge. The FCDMC is planning a regional detention basin north of the existing right-of-way. Portions of these basins have been constructed with the upstream channelization project.

2.7.3 Eastbound I-10 at Canyon Trail Development

The Canyon Trail residential subdivision to the south of the freeway restricts the expansion of the right-of-way. As a result, a combination retaining/sound wall will be constructed as part of the I-10/303L interchange project.

3.0 HYDROLOGY

Hydrologic models were not developed for the offsite watershed. Offsite hydrology for major structure crossings is available in several recent Flood Control District of Maricopa County studies.

3.1 OFFSITE HYDROLOGY FROM PREVIOUS STUDIES

Offsite hydrology for major structures is documented in Table 2.2. Recent Flood Control District of Maricopa County studies have reduced the peak discharges for the I-10 crossing of Bullard Wash. URS prepared a Technical Memorandum documenting the hydrology for the I-10 crossing of Bullard Wash. This memorandum, which was provided to ADOT November 1, 2006, recommends interim and future 100-year peak discharges for this crossing. The interim peak discharges are 2,521 cfs upstream of I-10 and 2,249 cfs downstream of I-10, and future peak discharges of 3,200 cfs through the I-10 crossing. The FEMA LOMR dated October 17, 2006 uses the interim peak discharges for the crossing, and therefore, these peak discharges will be used for the interim condition of the I-10 bridge crossing.

The 500-year peak discharge will be estimated at 1.7 times the 100-year peak discharges.

3.2 DRAINAGE BASIN DELINEATION AND TOPOGRAPHY

Drainage delineations for on-site pavement runoff are shown on the Drainage Plan Sheets in Appendix I.

3.3 PRECIPITATION

Point precipitation frequency estimates for the project were determined using the online NOAA Atlas 14 maps. Rainfall depths were values and maps are located in Appendix C.

3.4 RATIONAL EQUATION

The rational runoff method calculates the peak discharge using the algebraic formula:

$$Q=CiA$$

Where, Q = peak discharge (cfs)
C = the runoff coefficient
i = average rainfall intensity (inches/hour)
A = the contributing drainage area (acres)

A summary of the rational equation calculations for the project is located in Appendix D. Each of the rational equation components is discussed below.

3.4.1 Rational Runoff Coefficient: C

The value of the 'C' coefficient is a function of the one-hour precipitation depth, vegetation cover, percent of effective impervious area and the hydrologic soil group (HSG).

The "C" coefficients for each soil map number can be determined using Figure 2.5 in the ADOT HDDM. Composite coefficients would then be determined for each sub-basin. Only onsite peak runoffs were determined for this project.

3.4.2 Rational Rainfall Intensity: i

The intensity (i) in the Rational Runoff equation is the average rainfall intensity for a selected return period with a rainfall duration that is equal to the time of concentration. The time of concentration is the travel time, during the corresponding period of most intense rainfall excess, for a flood wave to travel from the hydraulically most distant point in the watershed to the point of interest.

Rainfall data utilized for the project can be found in Appendix C.

For the rational runoff method, the rainfall depths were converted to rainfall intensities. An iterative process is utilized to determine the relationship between the rainfall intensity and the time of concentration of the basin. Refer to Appendix C for the Intensity-Duration-Frequency (I-D-F) curves for 0 to 60 minutes that were utilized in the Rational Equation. The minimum T_c used for the project was 10 minutes, as per ADOT criterion.

The time of concentration was developed from the following iterative equation (HDDM, 2-2):

$$T_c = 11.4\, L^{0.5}\, K_b^{0.52}\, S^{-0.31}\, I^{-0.38}$$

Where,
T_c = Time of concentration (hours)
L = Length of the longest flow path (miles)
K_b = Watershed resistance coefficient
S = Slope of the longest flow path (ft/mile)
I = Average rainfall intensity (in./hr)

The resistance coefficient (K_b = 0.10) was determined from Table 2-1 in the ADOT HDDM.

4.0 HYDRAULIC ANALYSIS

4.1 PROCEDURE

Procedures and methodologies outlined in the two ADOT publications entitled *Roadway Design Guidelines* (RDG) and *Highway Drainage Design Manual-Hydraulics*, and the Federal Highway Administration *Hydraulic Design Series 5, Hydraulic Design of Highway Culverts*, were utilized for design of the cross drainage systems. The hydraulic calculations were done using the Haestad Method's Culvertmaster and/or HY-8. The hydraulic calculations for the onsite drainage systems were performed using the Haestad Method's 'Flowmaster' and 'StormCad' proprietary programs.

4.2 ROADSIDE DRAINAGE DITCHES

Roadside drainage ditches will be constructed to collect both onsite and right-of-way runoff and carry the flows to appropriate cross drainage structures.

The hydraulic grade line for ditches should be no higher than the sub-grade for the 10-year event and not higher than 3 inches below top of pavement edge for the 50-year event. In addition, ditches that drain to sag points shall be checked for the 50-year storm event. Ditches should have a bottom with a minimum width of 4 feet and a desirable width of 8 feet for maintenance, with a 2% cross slope to one side to concentrate low flows and transportation of sediment. A minimum grade of 0.2% for earth and grass lined ditches.

Where existing drainage ditches are filled by roadway embankment, they will be realigned along the toe of slope where appropriate. Dumped riprap will be provided, if necessary, to avoid erosion of the roadway embankment slope. A minimum one-foot of freeboard should be provided. These ditches, which intercept and redirect cross flows, should be designed for the 50-year storm event.

The open channels were analyzed by using the computer program Haestad Method's *Flowmaster Open Channel Flow Module*. They were sized and lined based on maintenance and design requirements. The ditch design computations along with the channel plans and profiles with typical sections will be included in Appendix F in the Final Drainage Report.

The contributing drainage areas for ditch design are outlined will be included in Appendix F in the Final Drainage Report.

4.2.1 Ditches Along Retaining Walls

The construction of nine retaining walls will require ditches along the roadway side to collect runoff.

The retaining wall ditches will be designed as follows:

- The 10-year event will be used to size the interceptor ditches in accordance with ADOT Design Criteria.
- The trapezoidal ditches consists of a 2-foot wide bottom with side-slopes of either 4 horizontal to 1vertical or 3 horizontal to 1 vertical as appropriate based on the roadway geometrics.
- The longitudinal channel gradient was maintained at approximately 0.2%.
- The channel hydraulics was performed with a Manning Roughness coefficient value of 0.035, which is representative of a natural vegetated earth surface.

4.3 PAVEMENT DRAINAGE

4.3.1 Discussion

The on-site pavement drainage system shown on the roadway plans is presented in Appendix B. This system is comprised of pavement catch basins that will maintain storm water encroachment on the roadway below acceptable limits. The catch basins and connector pipes were designed to meet the ADOT criteria for the 10-year and 50-year storm events.

4.3.2 Facility Selection

Storm water interception of pavement runoff will be accomplished with roadway grate catch basins, embankment down-drains and scuppers. The selected facilities are:

- ADOT Catch Basin, Catch Basin Flush, Drawing C-15.80.
- ADOT Catch Basin, Catch Basin Side Slope, Drawing C-15.81.
- ADOT Catch Basin, Freeway Catch Basin, Drawing C-15.91.
- ADOT Catch Basin with Concrete Half Barrier 32" Type 'F', Drawing C-15.92
- ADOT Embankment Spillway, Single Inlet, Drawing C-04.10.

- Bridge Deck Drains, Drawing B-19.10

4.3.3 Pavement and Embankment Drainage (Hydrology)

The Rational Method was employed to determine the peak runoffs from pavement and landscape areas. Parameters used were:

Design storm	-	10 and 50 years
Time of concentration	-	10 minutes
Rainfall intensity (10 yr.)	-	3.80 inches/hr. Max.
Rainfall intensity (50 yr.)	-	5.31 inches/hr Max.
Runoff Coefficients	-	Paved areas = 0.95, Unpaved area (Moderate Urban, 40% Impervious) = 0.70

Section 3.0 contains a discussion on the Rational Method.

4.3.4 Inlet/Catch Basin Spacing Design

Catch basin spacing and pavement spread calculations were determined by employing the Hydraulic Engineering Circular No. 22, *Drainage of Highway Pavements,* FHWA, November 1996. The actual calculations were completed by a Haestad's "Flowmaster" computer program. This program is a registered trademark of Haestad Methods, Inc. 37 Brookside road, Waterbury, Connecticut, 06708.

The combination catch basin and slotted drain structures in the median were designed with the slotted drains sized to provide 100% runoff interception.

- Allowable Ponding Depth

Allowable ponding depth should not exceed the height of the curb for the 10-year runoff. The catch basins ponding limits are evaluated for the appropriate design storm and checked for the other storm to insure spread compliance with both design storms.

At entrance/exit ramps, the allowable spread criterion varies from the ramp criterion at the ramp gore to the mainline spread criterion at the point of full width mainline pavement. Application of this concept is graphically depicted for 5 ramp types in Figure 603.2A, Chapter 600, ADOT Roadway Design Guidelines.

10-Year Runoff: One-half of the right travel lane (or auxiliary lane) encroachment and no left travel lane encroachment for roadways with more than one lane in each direction. No lane encroachment for one-lane roadways.

50-Year Runoff: One full right travel lane (or auxiliary lane) encroachment and no left travel lane encroachment for roadways with more than one lane in each direction. No lane encroachment for one-lane roadways.

A depressed roadway is defined as any roadway whose ultimate ponded depth (assuming no outflow at the sag) is 30 inches or more.

- Catch Basin Capture Ratios

	Inlet Capture Ratio	
Type	Sump	On-Grade
Curb-opening	80	80
Grate inlets	50	50
Slotted drain	50	67
Slotted drain/Grate inlets	50/50	67/50

- Grates

The selected locations for the new catch basins were based on roadway profiles, catch basin spacing required to maintain water spread on the pavement below maximum allowable, near superelevation crossover points to minimize sheet flow across the pavement, and at the low point in sag areas.

The onsite drainage areas, peak discharges (10- and 50-year events) and time of concentration for the on-site drainage are included in Appendices D and I, respectively. Calculations for spacing and sizing the catch basins are also included in Appendix D.

4.3.5 Storm Sewer Design

Storm sewer pipe sizes and the hydraulic grade line were determined with a computer program. STORMCAD is a computer program that designs and analyzes new and existing storm sewer system for non-uniform flow, and the hydraulic grade line (HGL). STORMCAD is a registered trademark of Haestad Methods, Inc., 37 Brookside Road, Waterbury, Connecticut, 06708. The storm sewer design was based on criteria contained in ADOT's Roadway Design Guidelines Manual dated Draft December 2005. These are:

- Minimum Pipe Size

Trunk Lines - 24-inches, except 18-inch pipes may be used where conflicts occur with utilities or other highway appurtenances.

Laterals - 18-inches

- Storm drain length between Manholes

  Pipes under 33-inches in diameter: 330 feet

  Pipes 36 and 39-inches in diameter: 440 feet

  Pipes form 42- to 69-inches in diameter: 660 feet

  Pipes 72-inches in diameter and larger: 1,200 feet

- Pipe Material and Roughness

  Pipe material was selected based on the requirements of ADOT's Pipe Selection Guidelines and Procedures, February 1, 1996. Manning's "n" values used for the selected pipe materials are:

Pipe Material	Manning's "n"
Concrete Pipe	0.012
Plastic Pipe, Smooth	0.012
Corrugated Metal Pipe	0.024
Spiral Rib: Galvanized Steel	0.014

Approved pipe types include reinforced concrete pipe (RCP), non-reinforced concrete pipe (NRCP), and corrugate high-density polyethylene plastic pipe (CHDPEPP) Class S (sizes less than or equal to 42-inches in diameter under fills less than 10 feet in height).

- Pipe Size Design

Pipe size selection was based on full flow with the 10-year storm event for non-depressed roadways. The hydraulic grade line was set a minimum 6 inches below the top of grate for the selected design storm event.

Desirable "Self Cleaning" velocity is 3 feet per sec flowing full. The minimum velocity flowing full is 2 fps. Some exceptions occur due to catch basins requirements at transitions and end of barriers and short pipe connections of flanking catch basins.

The storm sewer calculations for pipe sizes and hydraulic grade lines are contained in Appendix E. Proposed storm drain profiles are depicted on the details included in Appendix B.

4.4 BRIDGE DECK DRAINAGE EVALUATION

There are seven bridges within the project limits: Estrella Parkway Traffic Interchange Overpass (T.I.O.P.), Bullard Wash Overpass, Bullard Avenue T.I.O.P., SPRR Overpass, Litchfield Road T.I.O.P., Dysart Road T.I.O.P., and Agua Fria River.

SPRR Overpass has sufficient longitudinal grade to provide positive drainage. Supporting computations included in Appendix D (catch basins CB180 and CB182) shows that runoff spread remains within ADOT design limits along the bridge deck and corresponding anchor and approach slabs. Therefore, drainage systems are not required for this bridge.

Bullard Wash Overpass is being replaced with a shorter span bridge as part of the I-10 Median Widening project. Calculations for the median widening project shows that the spread criterion is met without installing deck drains. The remainder of the runoff is collected at the east end of the bridge by new roadway catch basins.

The Agua Fria Bridges are approximately 1500 feet long with a minimal longitudinal slope of approximately 0.0021'/ft and a transverse slope of 0.02'/ft. Existing scuppers are 6-inch diameter holes with 0.5-inch depression placed at 19-foot intervals along the outside edge of the bridge. Both Eastbound and Westbound bridges will be widened from 91'-7" to 102'-7". Near the west end of the Westbound bridge, the width tapers to a maximum width of approximately 106'$\pm$. The proposal is to reconstructed these same scuppers at an 18'-9" spacing along the outside edge of both bridges. Based on calculations contained in Appendix H, the proposal will meet ADOT's spread criterion. The actual 10-year runoff to each scupper is 0.159 cfs within the 102'-7" bridge width segment and 0.165 cfs within the 106' bridge width segment. The maximum allowable capacity of each scupper is 0.334 cfs.

The remaining four bridges: Litchfield Road T.I.O.P., Estrella Parkway T.I.O.P., Bullard Avenue T.I.O.P. and Dysart Road T.I.O.P. experience site specific drainage issues discussed below.

4.4.1 Estrella Parkway Bridge

The longitudinal profile of the existing bridge shows a localized low point in both the eastbound and westbound lanes. However, during the I-10 Median Widening project, the bridge deck will be resurfaced in both directions to remove the low points and create positive grades towards both ends of the bridge. Because the bridge resurfacing has removed the low points, the need for deck drains on the bridge is not warranted.

4.4.2 Bullard Avenue Bridge

The eastbound Bullard Avenue Bridge is approximately centered on a crest vertical curve. Sufficient longitudinal grades in both directions from this crest provide positive drainage to the bridge ends while meeting ADOT's criterion. Bridge deck drains are not warranted.

The westbound lanes across Bullard Avenue Bridge and its approaches are in a super-elevation transition from a positive to negative cross-slope with a longitudinal high point near the west end of the bridge. The change from a positive to a negative cross-slope occurs near the east end of the bridge. The super-elevation condition extends along the entire length of the bridge deck.

Surface sheet flow drainage through this roadway segment follows a curvilinear path due to the combination of super-elevation transition and horizontal curvature. The westbound driver experiences a roadway cross slope that transitions from 0.02'/ft away from the median to 0.039'/ft towards the median. Hence as the driver approaches the bridge the pavement runoff sheet flows left to right and as the driver leaves the bridge the pavement runoff sheet flows right to left. The change in flow direction occurs in the vicinity of the transverse level location, Station 6736+12.84. The center of the flow direction change is located at this station at the approximate mid-section of the pavement width. From this point towards the median, pavement sheet flow will originate at the median pavement edge to the east, flow westerly perpendicularly across the transverse level location, and return to the median pavement edge to the west. From this point towards the outside pavement edge, pavement sheet flow will originate at the outside edge to the west, flow easterly perpendicularly across the transverse level location, and return to the median pavement edge to the east.

A separate study on the drainage situation for the I-10 Westbound bridge over Bullard Avenue has been prepared for ADOT's review and comment. The final memorandum with recommendations will be included in the Final Drainage Report.

4.4.3 Litchfield Road Bridge

The existing longitudinal profile across Litchfield Road bridge shows localized low points on both the eastbound and westbound lanes. Again, the bridge deck was resurfaced during the I-10 Median Widening project to create a positive grade from west to east, which will eliminate the localized low points. Consequently, the need for bridge deck drains is not warranted. Instead, the bridge runoff will be collected at the east end of the bridge.

4.4.4 Dysart Road Bridge

The existing longitudinal grade across the Dysart Road bridge has a localized low point on the westbound lanes. The longitudinal grade along the eastbound lanes, although of minimum grade, will be sufficient for drainage and will not require resurfacing. The I-10 Median Widening project will resurface the westbound lanes to provide a positive grade. Consequently, the need for bridge deck drains is not warranted.

4.5 EROSION PROTECTION

Erosion protection was provided where recommended in the *Roadway Design Guidelines.* Dumped riprap aprons were used to reduce erosion at the outlets. Dumped riprap and filter fabric will be used to line ditches, where warranted. The type of erosion protection required is determined in accordance with Section 612.2 of the *Roadway Design Guidelines.*

4.6 AGUA FRIA RIVER

4.6.1 Background Information

The I-10 crossing of the Agua Fria River has been studied by the Flood Control District of Maricopa County (FCDMC) as documented in the report entitled, *"Final Report, System Analysis and Conceptual Design of Channelization in the Agua Fria River, October 10, 1983"* (Copy of pertinent sections are contained in Appendix H). Based on this study construction plans were prepared by the FCDMC for Channel Improvements to the Agua Fria River. As-Builts of these channel improvements are contained in Appendix J.

Appendix H also contains copies of ADOT Bridge Inspection Records and a recent bridge scour evaluation prepared for the 30% plans.

The most recent flow estimates obtained from the FCDMC are 52,000 cfs for the 100-year flow and 99,000 cfs for the 1989 Standard Project Flood. The ADOT methodology of multiplying the 100-year flow rate by 1.7 would provide a 500-year flow rate of 88,400 cfs.

The existing bridges were placed on spread footings set at an approximate depth of 24 feet below the existing riverbed elevation. This type of footing is no longer allowed in a river environment in accordance with ADOT current standards. However, it is cost prohibitive to replace these bridges, and therefore, a scour evaluation was performed to determine if these bridges are stable. The total scour, including general scour and long term degradation of 1.2 feet, was estimated at 13.5 feet for the 100-year event and 15.8 feet for the 500-year event (assumed to be 99,000 cfs). This indicates that the current footing depth is adequate.

The FCDMC channel improvements construction resulted in channelization of the river between soil cement levees and numerous grade-control and drop structures both upstream and downstream of these bridges. Furthermore, the addition of the New Waddell Dam in the upstream watershed has helped to stabilize the streambed.

4.6.2 Riprap Protection at Pier No. 1

The 1983 report stated that the bend in the river just upstream of the I-10 bridges could cause erosion near the western portion of the bridge. The recommendation was to construct a riprap blanket around the western piers. The channelization plans contained in Appendix J show that a change order was executed for the installation of a riprap blanket around the western most pier line (Pier No. 1). The width of this blanket extended from the base of the soil cement bank easterly to a point 10-feet east of the pier. The north-south dimension of this riprap blanket is 217 feet to be centered on Pier No. 1. The dumped riprap blanket was 4 feet thick with its top level with the new channel flow line. D_{50} was set at 18 inches.

A field inspection of the west abutment revealed that the above discussed dumped riprap blanket was installed to the width specified on the as-built plans. It appears to be in good condition and therefore, repairs are not necessary. The penetration of this blanket with pier substructure units will be repaired with this project. This riprap protection will be extended as necessary to include the additional columns to be installed with the outside widening. Additional evaluation of the scour around this bend is not considered necessary.

4.6.3 Pier Scour

Pier scour calculations have been performed for both the 100-year flood event and the Standard Project Flood event. Abutment scour calculations were not performed, because both abutment substructure units are protected by the soil-cement bank protection, which was designed and constructed by the Flood Control District of Maricopa County to withstand the Standard Project Flood event. Effective support needs to extend beneath the potential scour hole of 15.8 feet during the Standard Project Flood event. Pier scour calculations for the 100-

year and Standard Project Flood events are contained in Appendix H. The hydraulic parameters and scour depths for the two flow events are summarized in Table 4.1.

Table 4.1 Agua Fria River Pier Scour Summary, 100-Year and Standard Project Flood Events

Flood Event	100-Year	Standard Project Flood[1]
Peak Flow	52,000 cfs	99,000 cfs
Flow Velocity	7.5 fps	9.9 fps
Water Surface Elevation[2] (1929 NGVD Datum)	977.3 ft	979.9 ft
Water Surface Elevation[2] (1988 NAVD Datum)	978.5	981.1
Streambed Elevation (from Equilibrium Profile created by Downstream Grade Control Structure) (1988 NAVD Datum)[3]	971.9	971.9
Scour Depth (based on 16' clear between 3' diameter columns)[3]	13.5 ft	15.8 ft
Bottom of Scour Hole Elevation (based on 16' clear between 3' diameter columns) (1988 NAVD Datum)[3]	958.4[4]	956.1[4]
Scour Depth for Two Outside Columns (based on 14' clear between 3' diameter columns)[3]	18.3	21.4
Bottom of Scour Hole Elevation (based on 14' clear between 3' diameter columns) (1988 NAVD Datum)[3]	953.6[4]	950.5[4]

[1]The Standard Project Flood peak flow of 99,000 cfs is greater than the 500-year peak flow of 88,400 cfs.

[2]The datum conversion is 1929 NGVD = 1988 NAVD – 1.20 feet as determined by a URS survey of the existing bridge deck elevations. The ADOT project datum is 1988 NAVD.

[3]The current bridges, including the median widening project, have 3' diameter columns with minimum 16-foot spacing. Therefore, each column functions as a separate unit for the pier scour evaluation. However, the additional column required for the outside widening project may be closer than 16 feet to the existing outside bridge column, which means the two outside columns will function as a single stem pier with a local skew angle of 15 degrees. For this preliminary evaluation, the clear width between columns is assumed to be 14 feet. Four feet of debris is added to the normal width of pier.

[4]Existing bridge spread footings have top and bottom elevations of 949.2 and 946.2, respectively. (1988 NAVD Datum)

The outside widening project will result in an additional 3-foot diameter column upstream and downstream at each pier location. The existing bridge has columns spaced at 16 feet, which means that each individual pier column functions as a single unit for the pier scour

calculations. Anything shorter than 16 feet spacing requires that the piers function as a single stem pier with a local skew angle of 15 degrees. Of course this results in greater scour depths.

Structural requirements may require the additional outside column to be closer than 16 feet to the existing outside pier. Therefore, two scours evaluations were performed: one for a pier spacing of 16 feet and one for a pier spacing of 14 feet. For the Standard Project Flood event, the 14 feet spacing and the 16 feet spacing would result in bottom scour hole elevations of 950.5 and 956.1, respectively. The 14 feet spacing would only affect the two outside piers, one is an existing pier that is on a spread footing.

It is critical that the additional outside column does not create a situation that undermines the spread footing for the existing column. Existing bridge spread footings have top and bottom elevations of 949.2 and 946.2, respectively. Comparison of these elevations to the scour depth elevations for the Standard Project Flood Event are contained in Table 4.2.

Table 4.2 Comparison of Pier Scour for 14-foot versus 16-foot Column Spacing, Standard Project Flood Event[1]

Column Clear Spacing	Bottom of Scour Hole	Top of Existing Footing		Bottom of Existing Footing	
	Elevation	Elevation	Depth Below Scour Hole Bottom	Elevation	Depth Below Scour Hole Bottom
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
14	950.5	949.2	1.3	946.2	4.3
16	956.1	949.2	6.9	946.2	9.9

[1]The Datum is 1988 NAVD.

The design intent is to maintain 16 feet clear spacing in order to minimize the scour depth for the Standard Project Flood event, which is approximately the ADOT 500-year flood event. URS will coordinate any lesser spacing with the ADOT Bridge Group.

4.6.4 Hydraulic Evaluation

The widening of the Agua Fria Bridge will be with substructure units that are aligned with the existing substructure units, and therefore, upstream water surface elevations will not change significantly. On the median widening project, the FCDMC stated that this is not necessarily true and requested that the designers demonstrate that the 4-foot of freeboard, as required by the U.S. Army Corps' of Engineers, is still being provided. The evaluation for the median widening was completed and sent to the FCDMC on 23 June 2007. That evaluation stated that, "The revised model provides virtually the same water surface elevations as the original

model for the design flood, which is the Standard Project Flood (SPF) of 99,000 cfs. In fact, the water surface elevations show a decrease of 0.01 to 0.02 feet for the widened bridge. This decrease goes to zero (0) approximately 310 feet upstream of the McDowell Road Bridge." This E-Mail along with a summary of the evaluation is contained in Appendix H.

A similar hydraulic evaluation completed for the outside widening project is contained in Appendix H. The HEC-RAS model produced for the median widening project has been revised to model the outside widening project. The widening will consist of one additional 3-foot diameter column upstream and downstream at each pier. These columns will be in alignment with the existing 3-foot diameter piers. Model revisions consist of moving the upstream and downstream faces of the bridge to reflect a single bridge widened from 183'-2" to 229'-2" and to lower the low concrete elevation by 0.5 feet (24'x0.02'/ft). The pavement cross-slope is 0.02'/ft.

The revised model for the outside widening project provides virtually the same water surface elevations as the original model for the design flood, which is the Standard Project Flood (SPF) of 99,000 cfs. The water surface elevations show a change of –0.10 to 0.09 feet for the widened bridge. The –0.10 feet is at the downstream bridge face and the 0.09 feet is at the upstream bridge face. In general, the upstream water elevation increase is approximately 0.03 feet. This change in water surface elevation goes to an increase of 0.01 feet approximately 610 feet upstream of the McDowell Road Bridge and to zero (0) approximately 1760 feet upstream of the McDowell Road Bridge.

Currently freeboard upstream of the I-10 bridges varies from 6.59 to 7.21 feet for the West bank (Left Levee) and is 6.59 feet for the East bank (Right Levee). The East bank is breached with the I-10 Collector Channel, but the banks of the channel appear to maintain the required 4-foot freeboard. Since the proposed widening will raise the water surface elevation an insignificant 0.03 feet, the existing freeboard will not be compromised.

The low concrete of the I-10 Bridge in the model is 986.4, which provides 6.0' and 7.1' of freeboards at the upstream and downstream faces of the bridge, respectively. This is for the Standard Project Flood of 99,000 cfs, which is close to the 500-Year flood event. This easily meets ADOT's 3-foot minimum freeboard requirement for the 50-year peak flow event on Class 1 routes. I-10 is a Class 1 route.

5.0 REFERENCES

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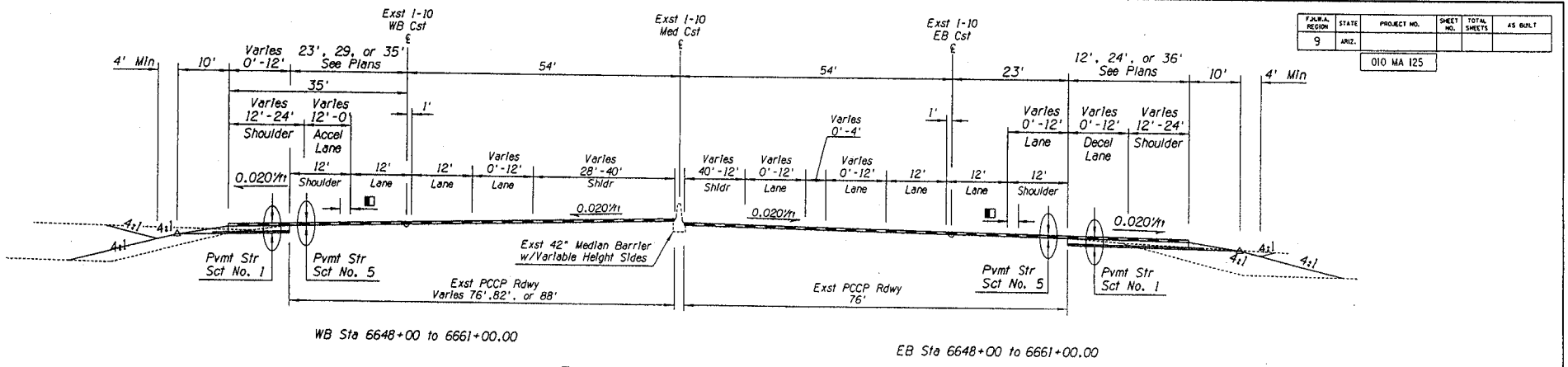
20. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, *Computer Program, HEC-RAS, River Analysis System, Version 3.1.3*, January 2005.

21. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, *Computer Program, HEC-1, Flood Hydrograph Package, Version 4.1*, January 2001.

22. Arizona Depart of Transportation, Preliminary Drainage Report (Stage II (30%) Plans, I-10 (Papago) Outside Widening, Sarival Avenue to Dysart Road in Maricopa County, Arizona, May 2007.

APPENDIX A

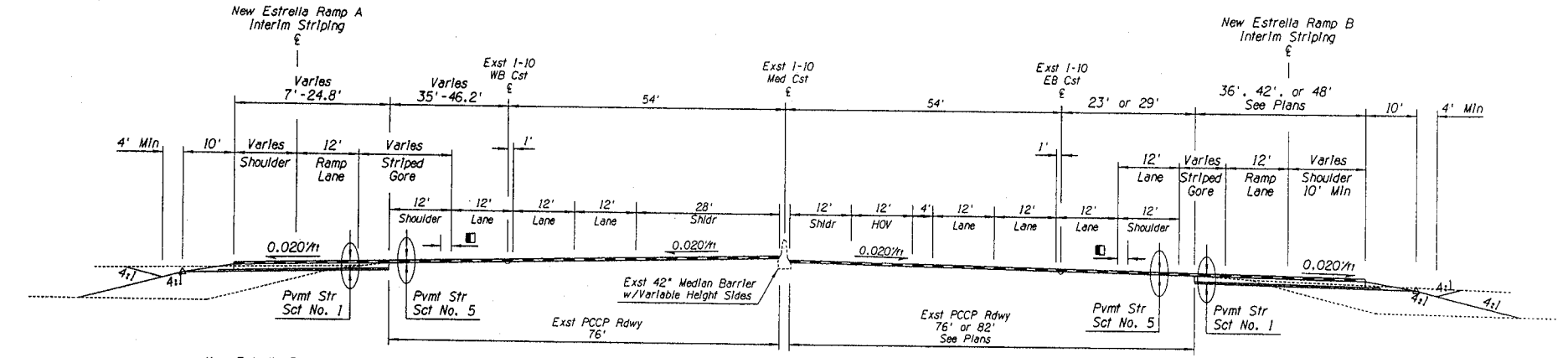
ROADWAY TYPICAL SECTIONS (STAGE III)



WB Sta 6648+00 to 6661+00.00

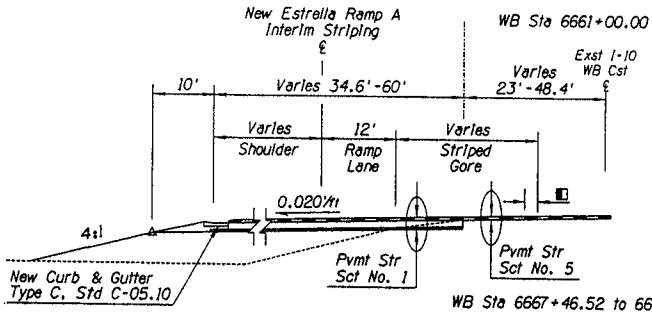
EB Sta 6648+00 to 6661+00.00

TYPICAL MAINLINE SECTION



WB Sta 6661+00.00 to 6667+46.52

EB Sta 6661+00.00 to 6664+94.76



WB Sta 6667+46.52 to 6668+83.46

TYPICAL MAINLINE SECTION

◧ Mill Existing 2" AR-ACFC

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	C ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE: I-10
LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.01

___ OF ___

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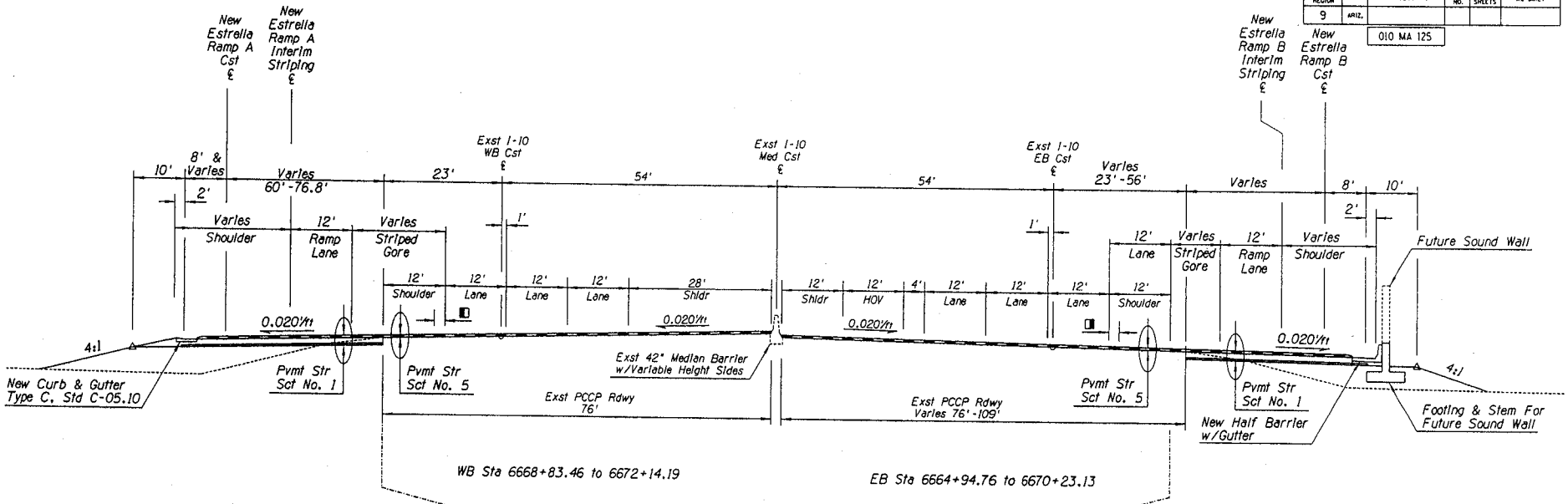
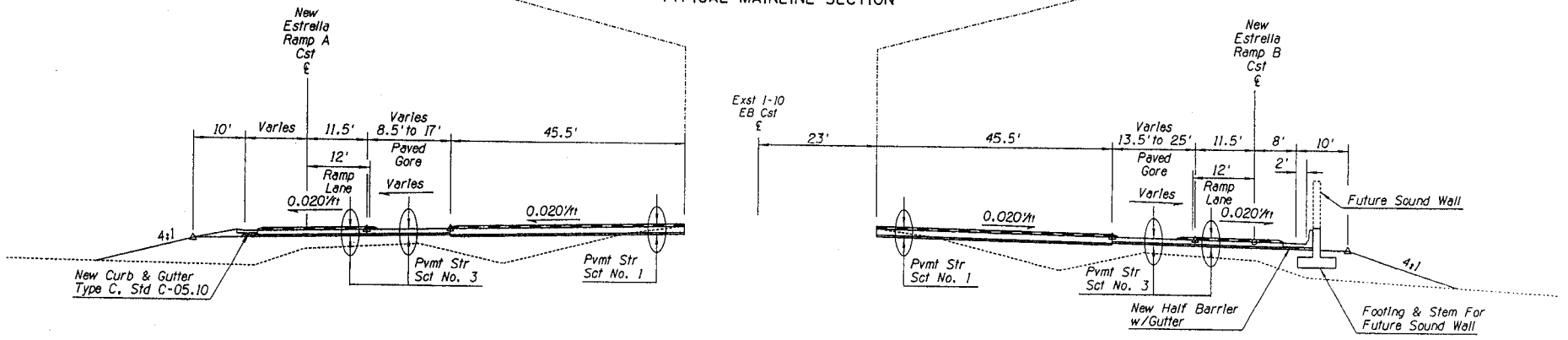


WB Sta 6668+83.46 to 6672+14.19

EB Sta 6664+94.76 to 6670+23.13

TYPICAL MAINLINE SECTION



WB Sta 6672+14.19 to 6673+52.70

EB Sta 6670+23.13 to 6671+89.47

TYPICAL MAINLINE SECTION

Mill Existing 2" AR-ACFC

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010 MA 125			

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHM	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

DWG NO G-03.02

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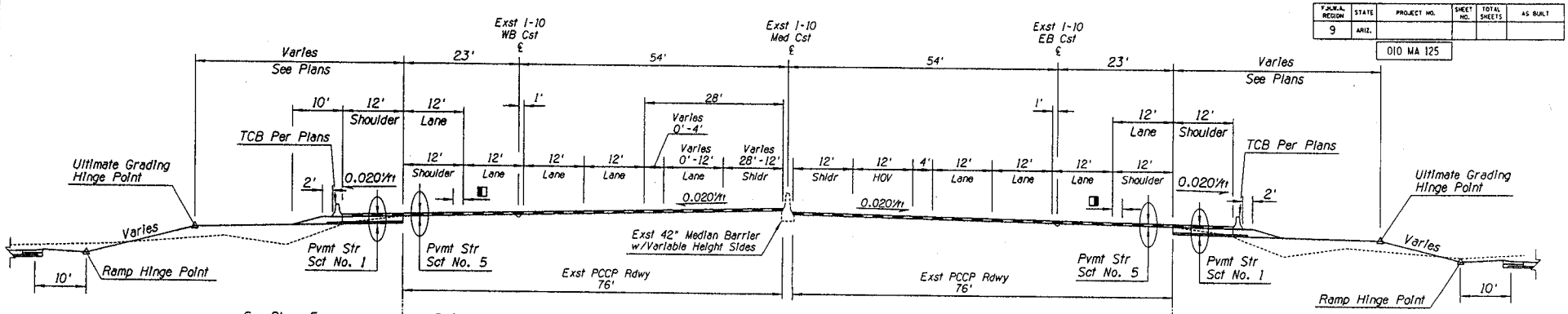
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



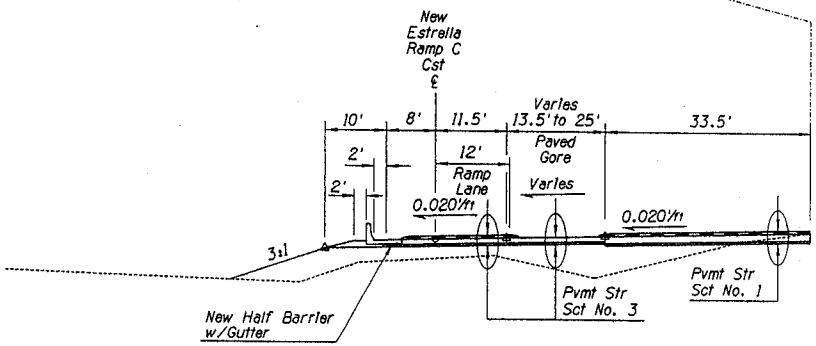
See Plans For Additional Widening Not Shown at Bridge Corners (PSS No. 4)

WB Sta 6673+52.70 to 6695+09.52*
* WB Sta 6682+06.23 to 6683+59.23, Bridge Exception

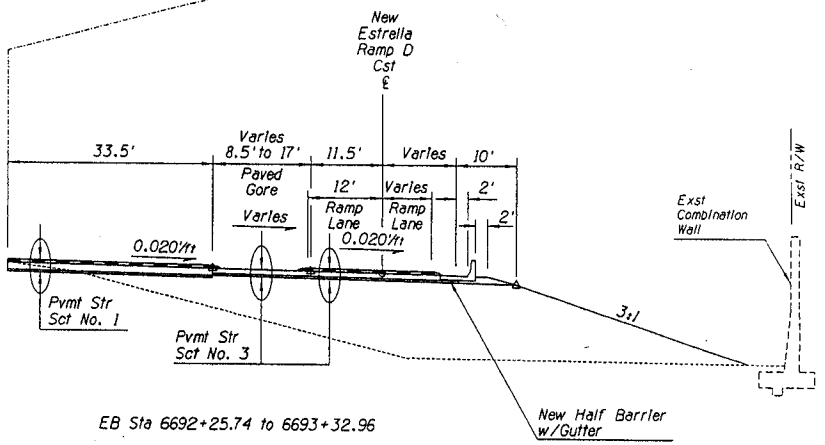
EB Sta 6671+89.47 to 6692+25.74*
* EB Sta 6682+06.23 to 6683+59.23, Bridge Exception

See Plans For Additional Widening Not Shown at Bridge Corners (PSS No. 4)

TYPICAL MAINLINE SECTION



WB Sta 6695+09.52 to 6696+74.66



EB Sta 6692+25.74 to 6693+32.96

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.03

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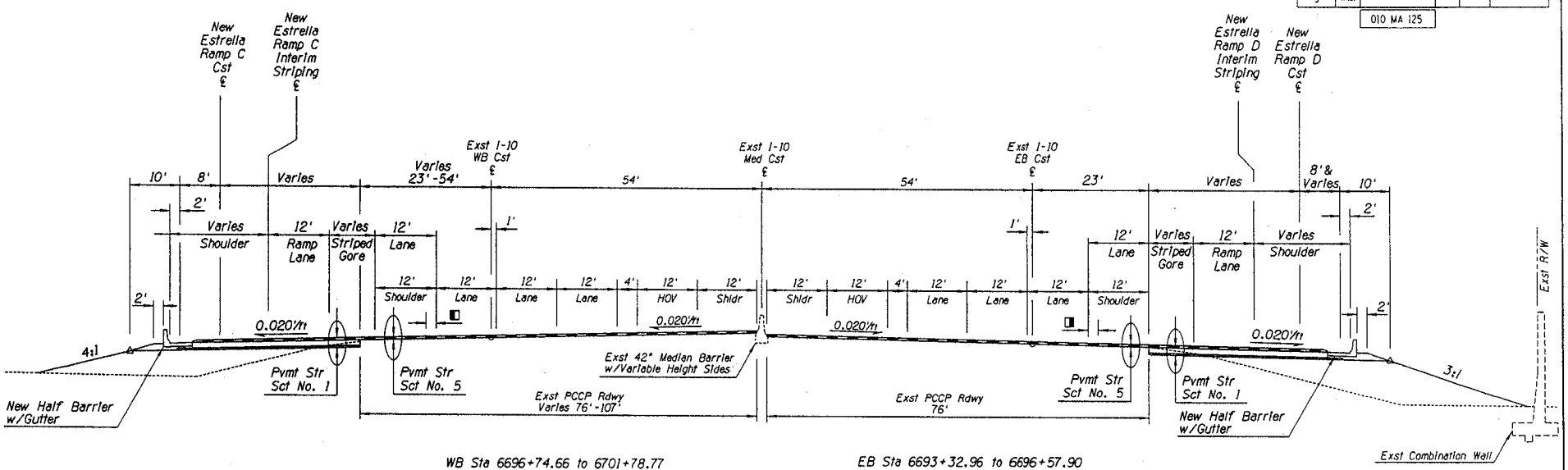
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

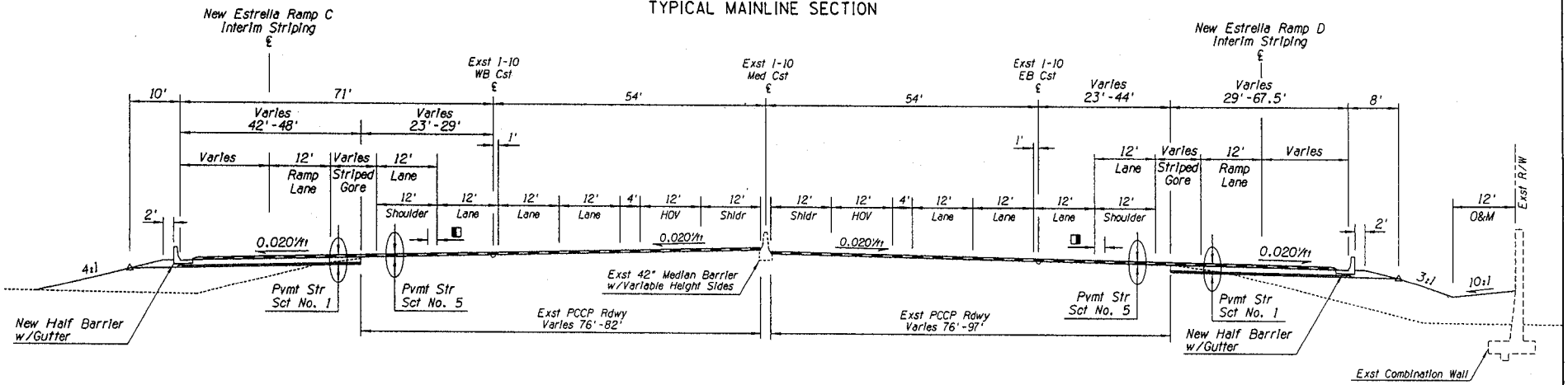
010 MA 125



WB Sta 6696+74.66 to 6701+78.77

EB Sta 6693+32.96 to 6696+57.90

TYPICAL MAINLINE SECTION



WB Sta 6701+78.77 to 6711+70.86

EB Sta 6696+57.90 to 6706+67.59

TYPICAL MAINLINE SECTION

◨ Mill Existing 2" AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.04

TRACS NO. H7296 01C

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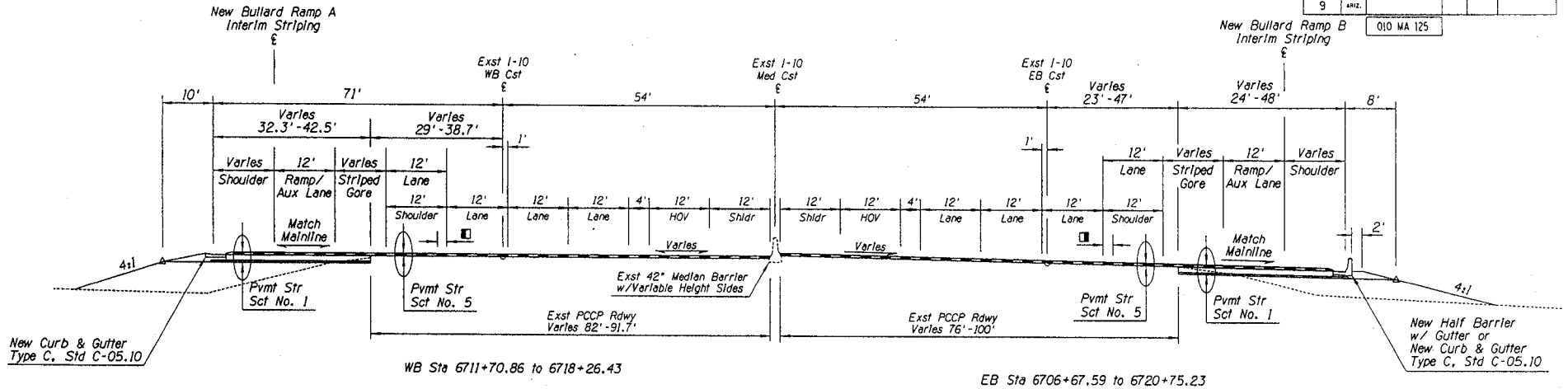
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

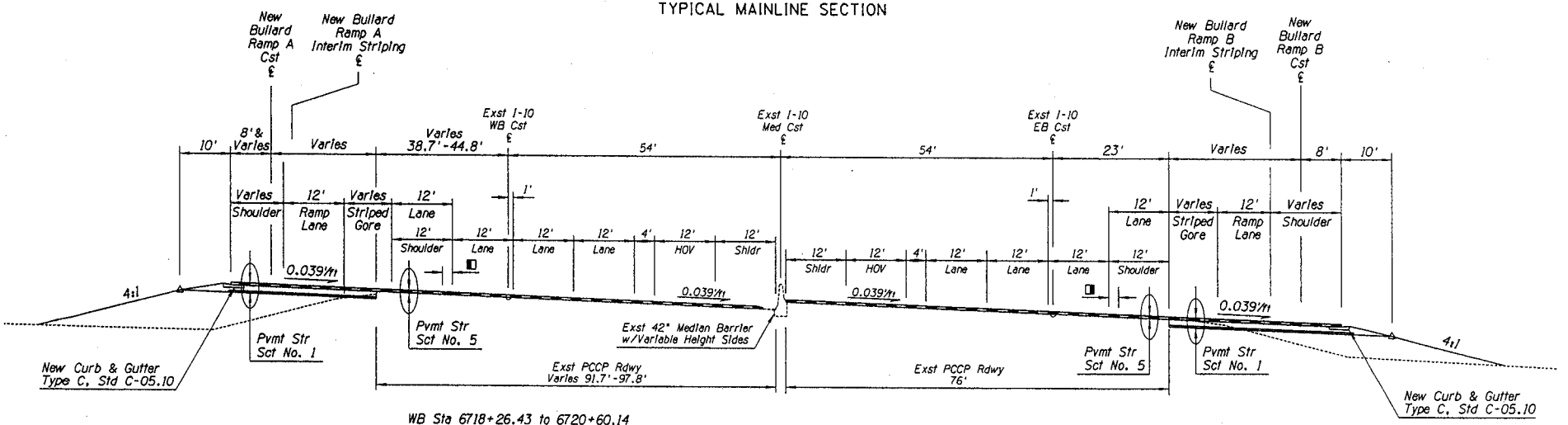
010 MA 125



WB Sta 6711+70.86 to 6718+26.43

EB Sta 6706+67.59 to 6720+75.23

TYPICAL MAINLINE SECTION



WB Sta 6718+26.43 to 6720+60.14

EB Sta 6720+75.23 to 6723+75.86

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHM	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.05

TRACS NO. H7296 01C

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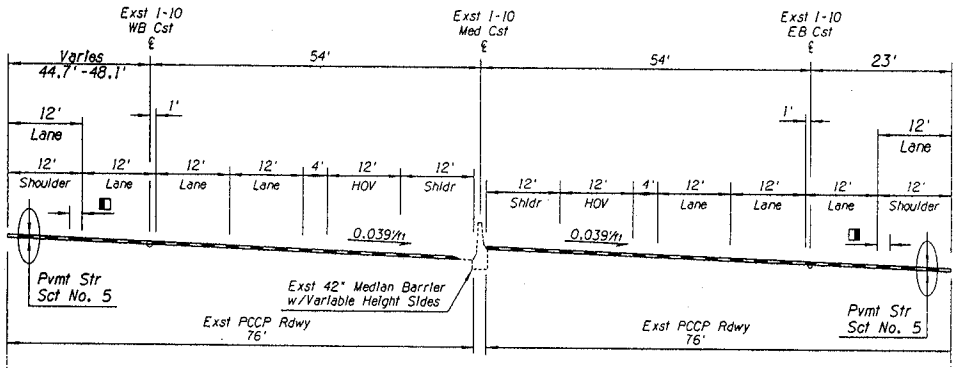
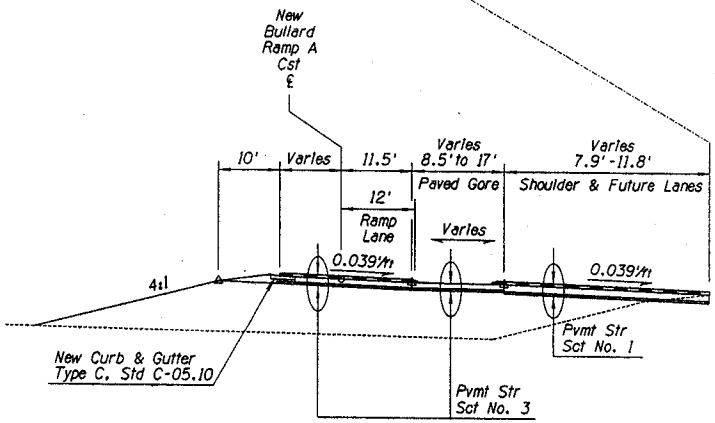
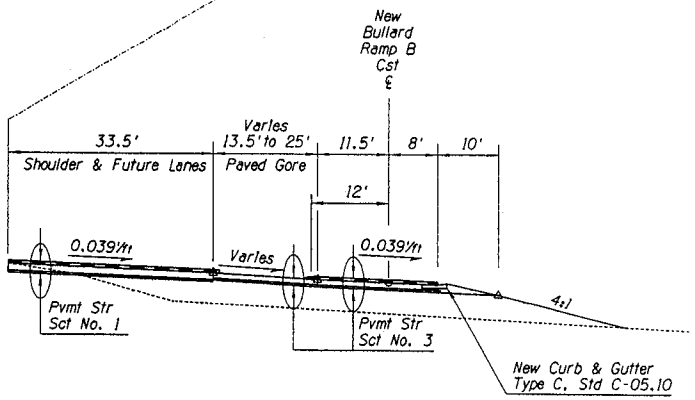
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				
		010 MA 125			





WB Sta 6720+60.14 to 6721+57.78



EB Sta 6723+75.86 to 6724+95.00

TYPICAL MAINLINE SECTION

▨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.06

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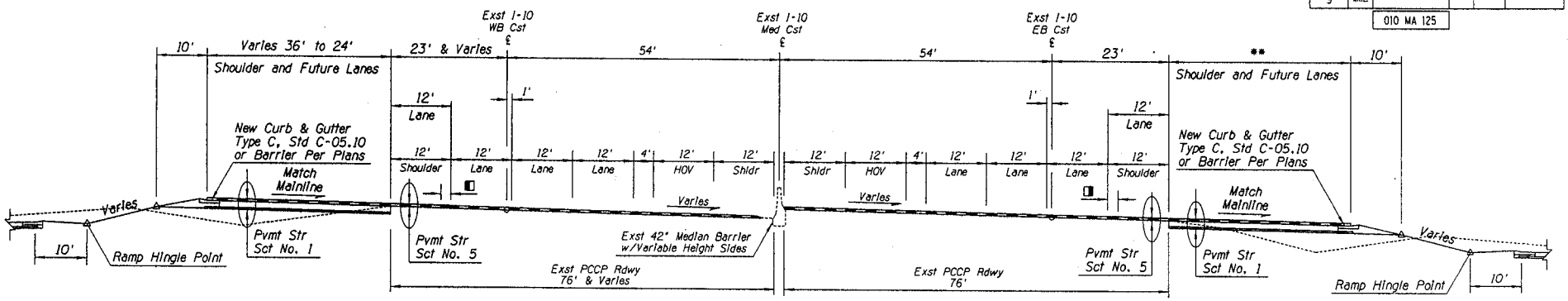
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

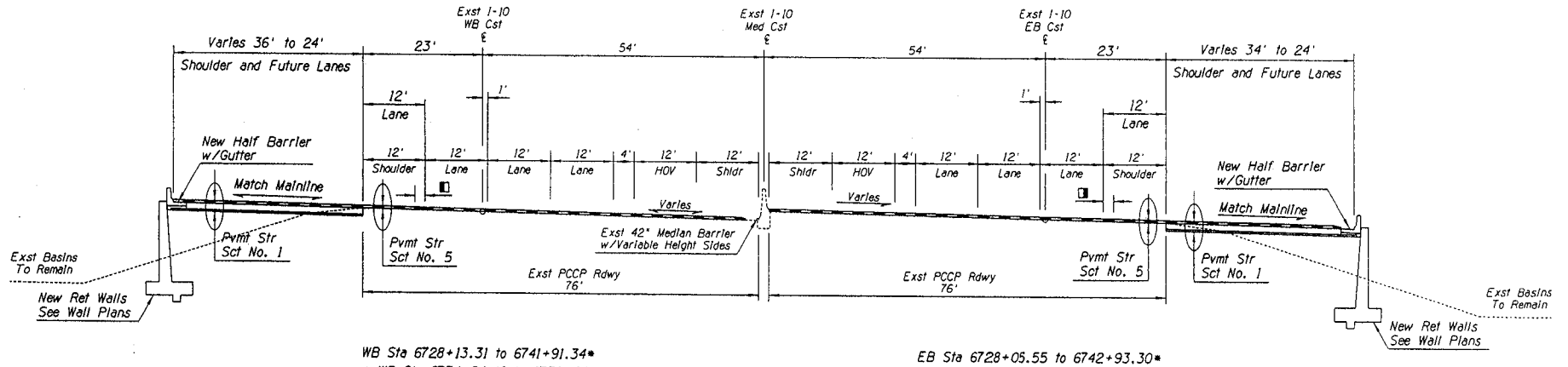
010 MA 125



WB Sta 6721+57.78 to 6728+13.31
WB Sta 6741+91.34 to 6747+06.67

EB Sta 6724+95.00 to 6728+05.55, ** Varies 36'-34'
EB Sta 6742+93.30 to 6748+30.03, * 24'

TYPICAL MAINLINE SECTION



WB Sta 6728+13.31 to 6741+91.34*
* WB Sta 6734+84.46 to 6736+25.65, Bridge Exception

EB Sta 6728+05.55 to 6742+93.30*
* EB Sta 6735+22.42 to 6736+63.61, Bridge Exception

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.07

TRACS NO. H7296 01C

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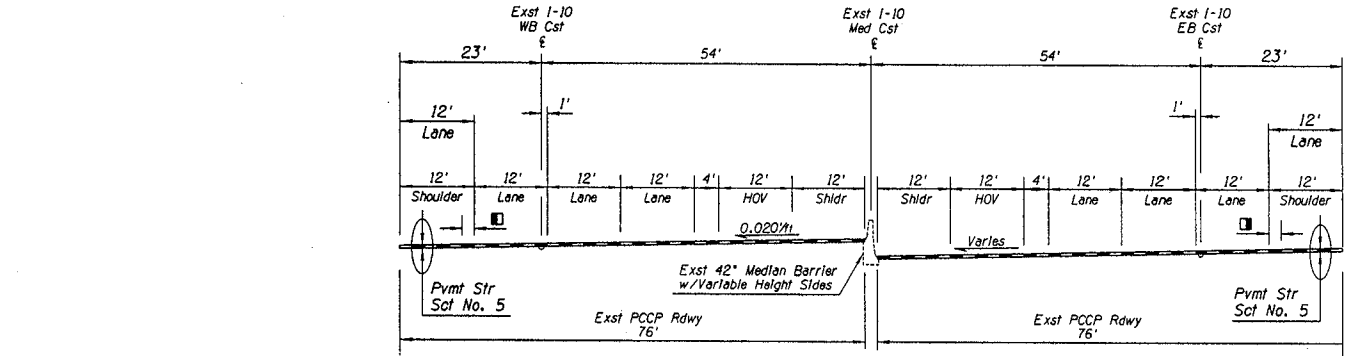
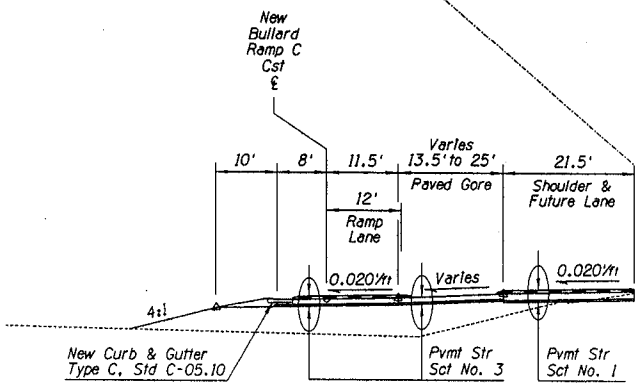
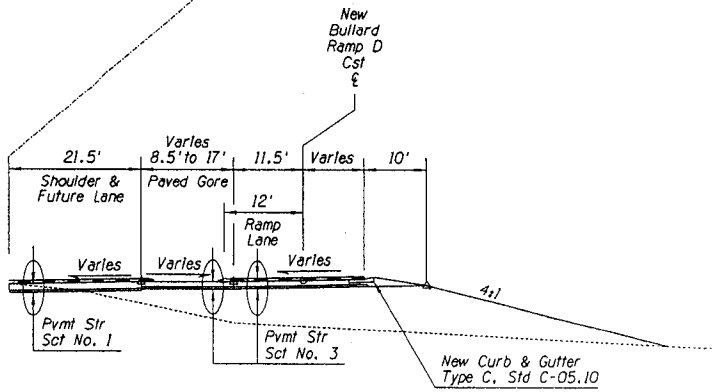
F.A.H.U. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125





WB Sta 6747+06.67 to 6748+16.72



EB Sta 6748+30.03 to 6749+37.13

TYPICAL MAINLINE SECTION

Mill Existing 2" AR-ACFC

	NAME	DATE
DESIGN	J. ROBERTS	02/08
DRAWN	E. ELY	02/08
CHECKED	B. DEHN	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. G-03.08

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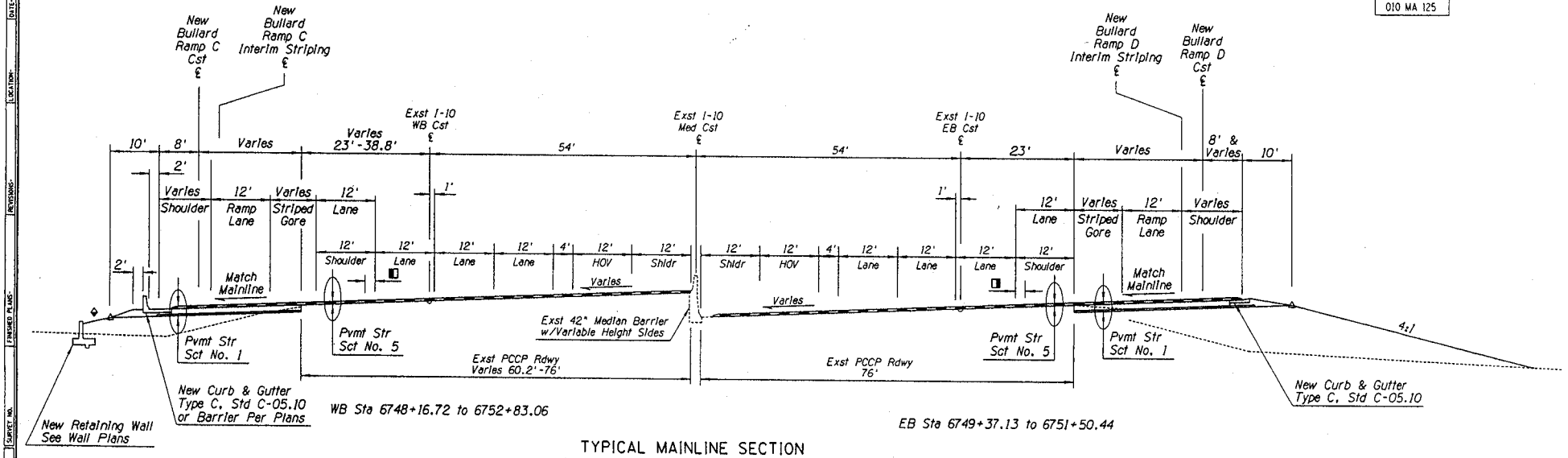
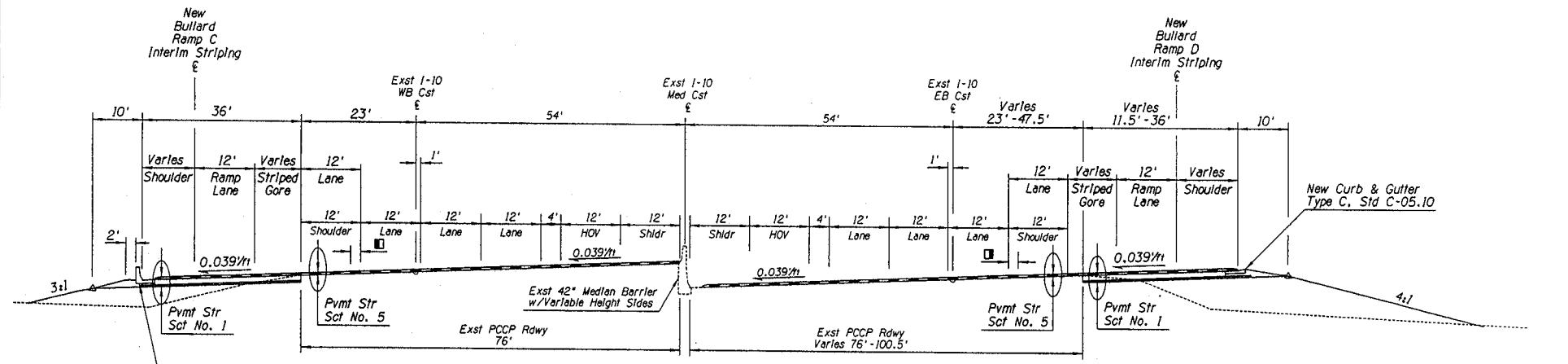
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



TYPICAL MAINLINE SECTION



TYPICAL MAINLINE SECTION

♦ See Slope Exception Table

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.09

TRACS NO. H7296 01C

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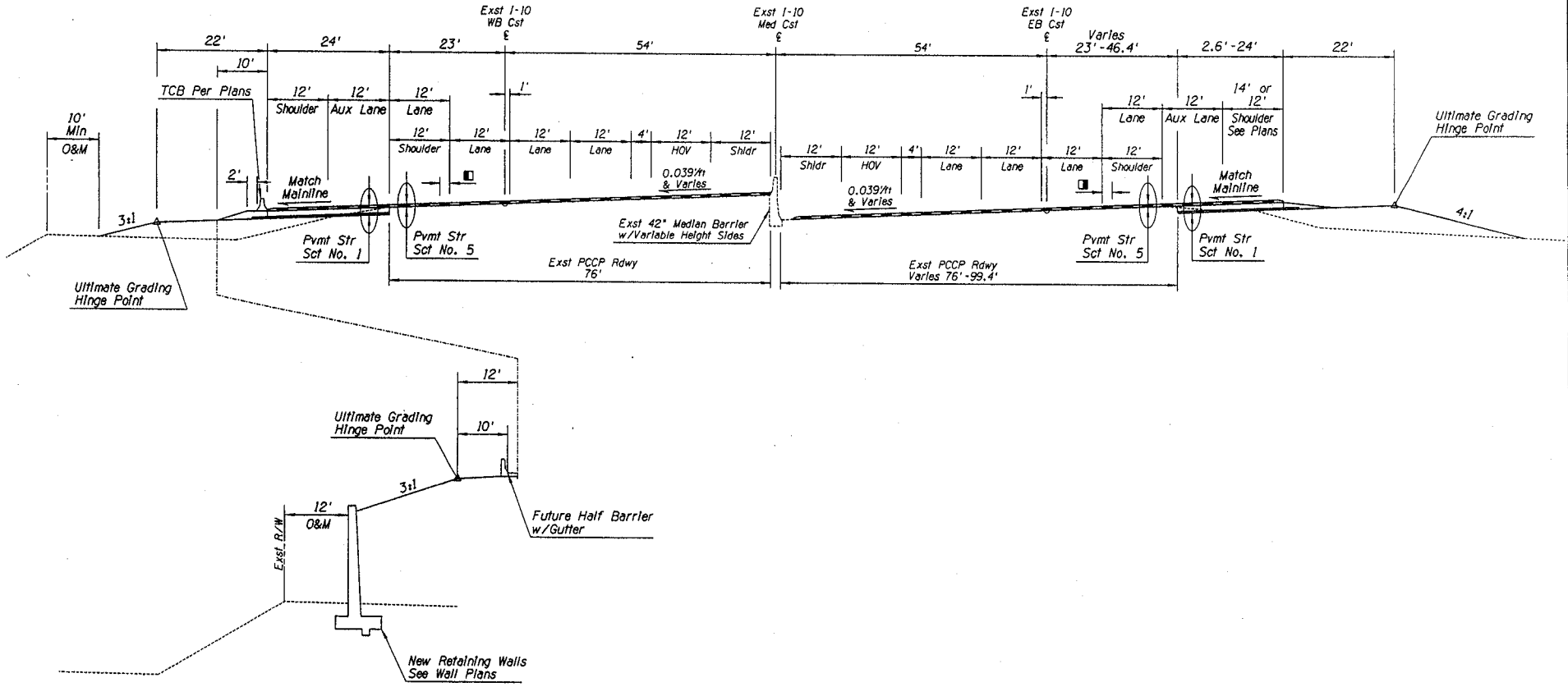
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



WB Sta 6755+00.00 to 6770+20.00

EB Sta 6753+75.00 to 6770+10.72

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHM	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.10

TRACS NO. H7296 01C

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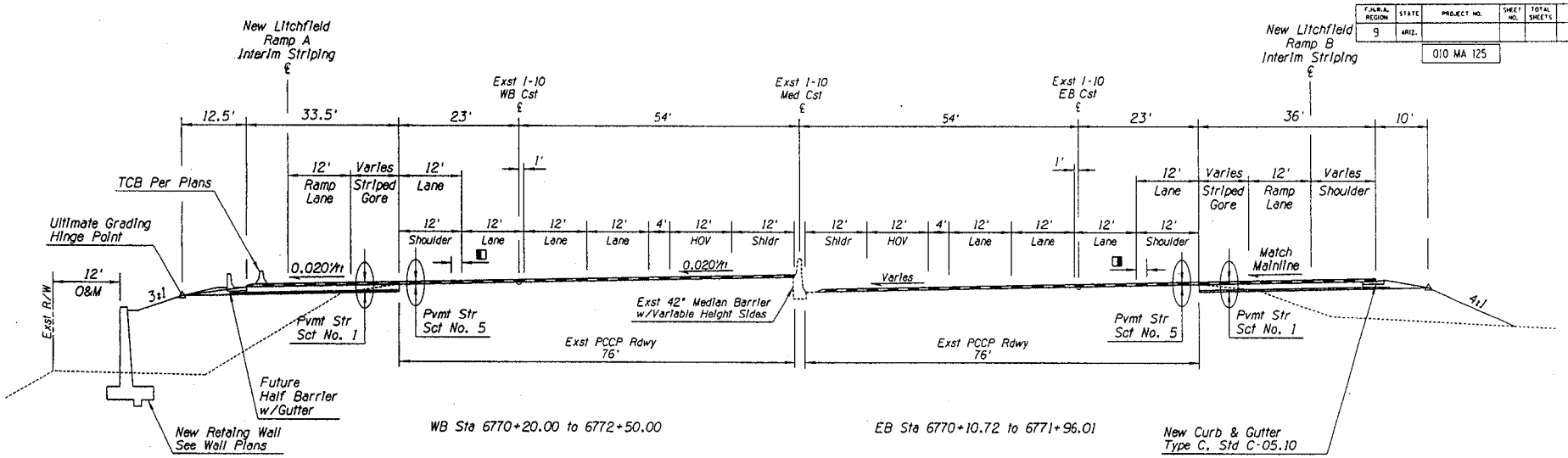
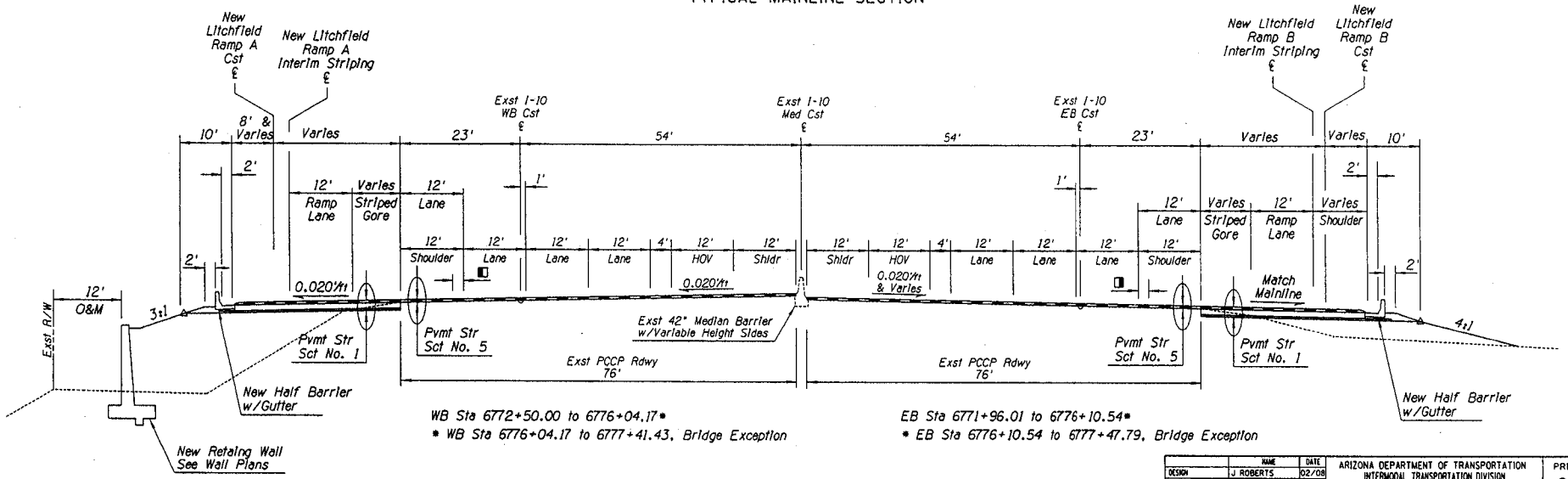
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010 MA 125			



TYPICAL MAINLINE SECTION



TYPICAL MAINLINE SECTION

Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO C-03.11

___ OF ___

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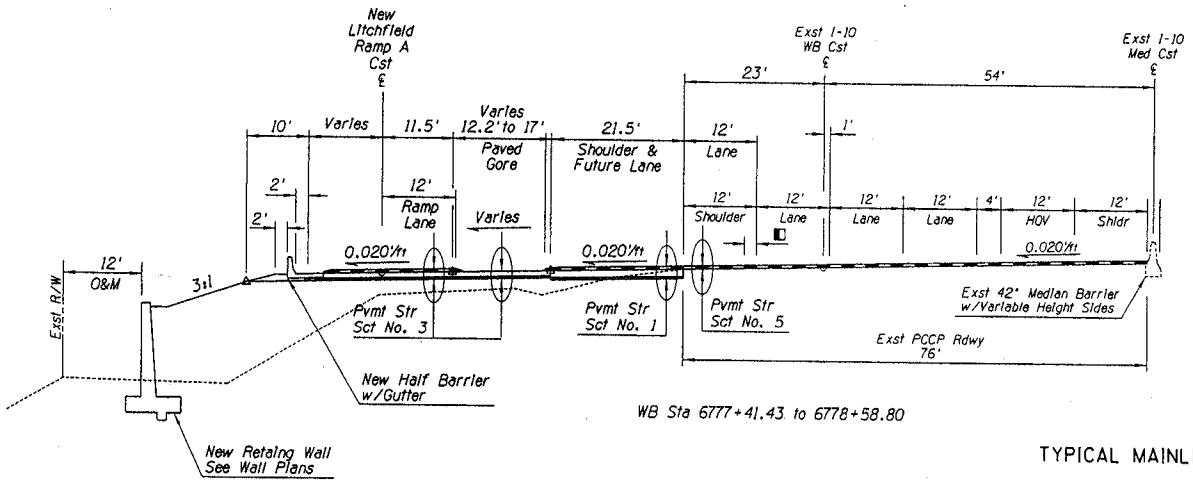
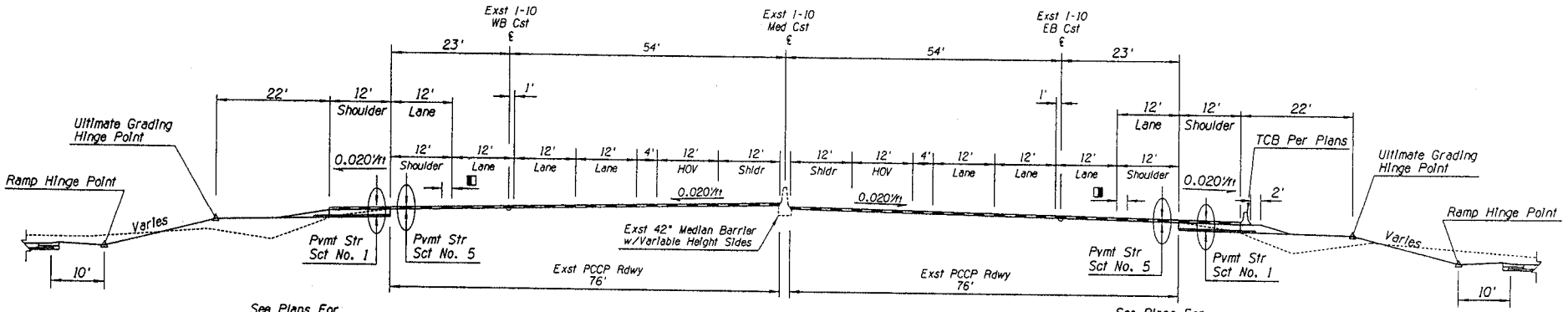
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				
		010 MA 125			



WB Sta 6777+41.43 to 6778+58.80

TYPICAL MAINLINE SECTION



WB Sta 6778+58.80 to 6788+26.79*
*WB Sta 6788+26.79 to 6789+89.79, Bridge Exception

EB Sta 6777+47.79 to 6788+27.05*
* EB Sta 6788+27.05 to 6789+90.05, Bridge Exception

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.12

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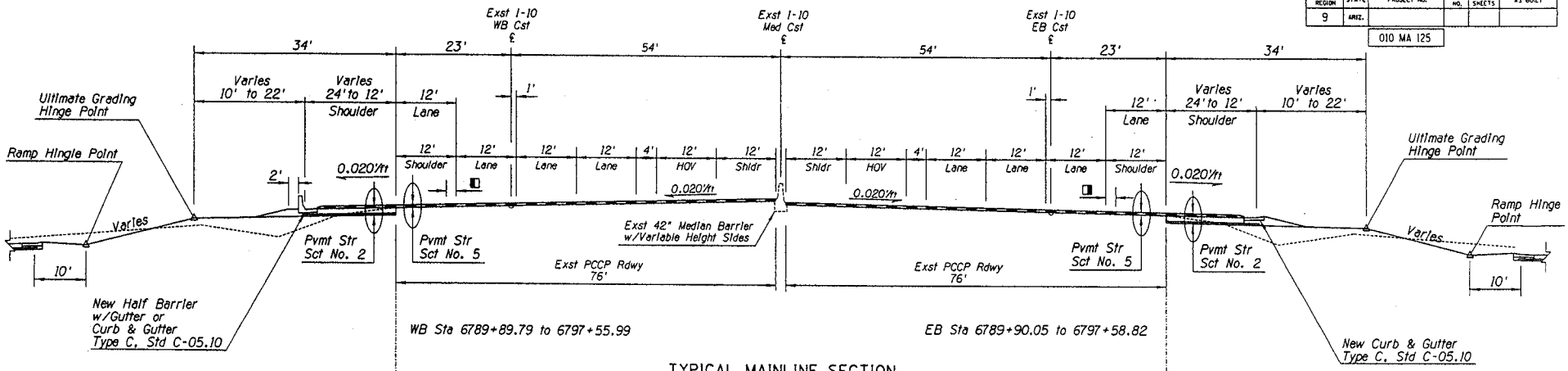
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

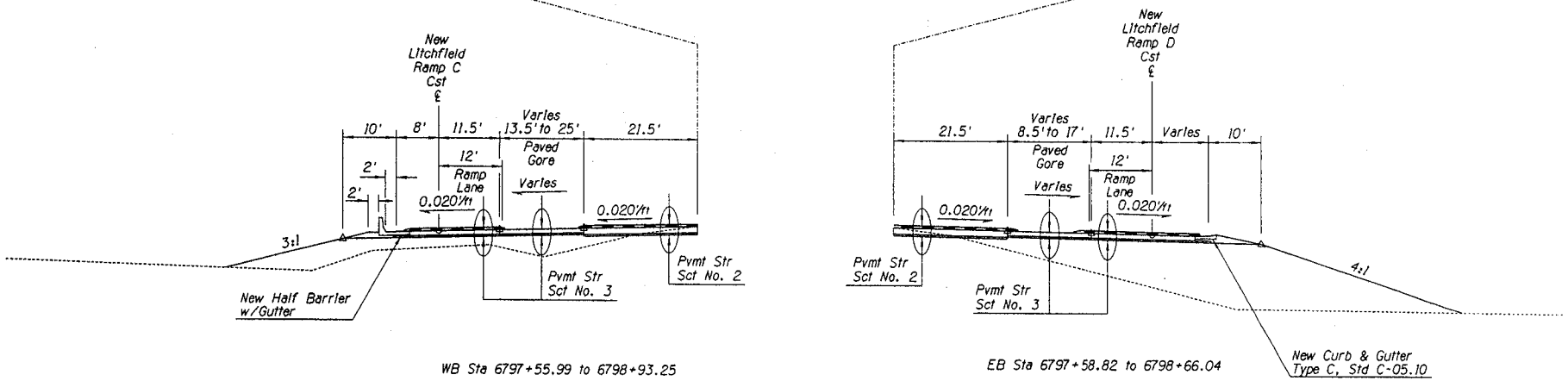
010 MA 125



WB Sta 6789+89.79 to 6797+55.99

EB Sta 6789+90.05 to 6797+58.82

TYPICAL MAINLINE SECTION



WB Sta 6797+55.99 to 6798+93.25

EB Sta 6797+58.82 to 6798+66.04

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.13

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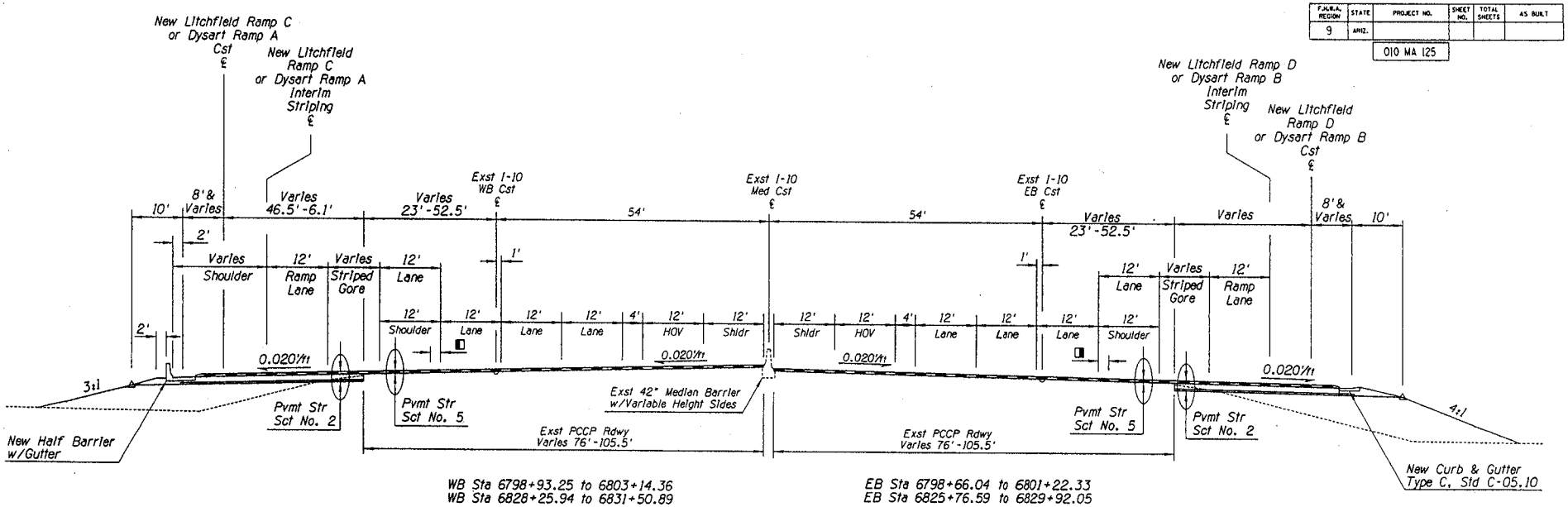
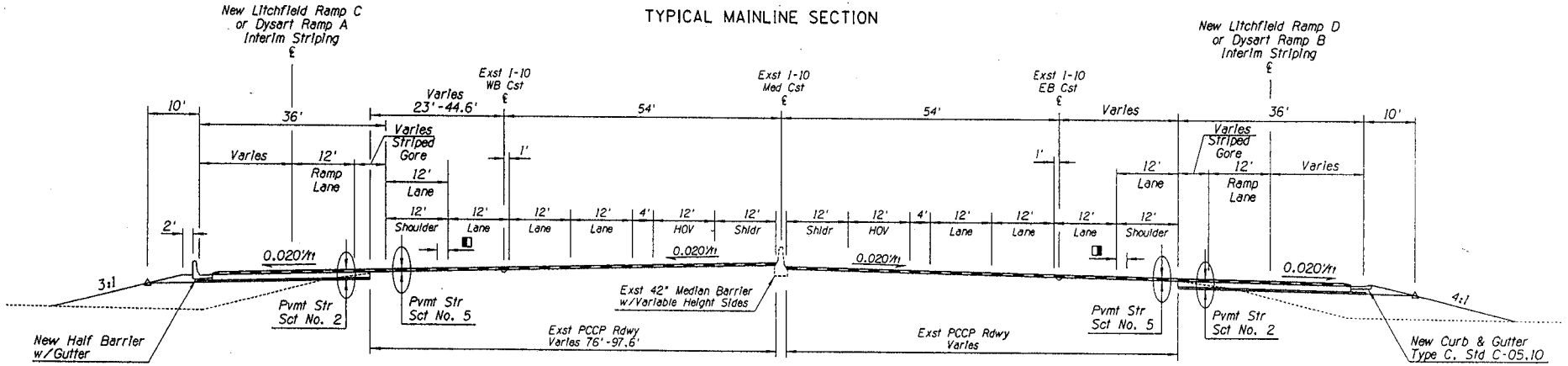
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				
		010 MA 125			



WB Sta 6798+93.25 to 6803+14.36
WB Sta 6828+25.94 to 6831+50.89

EB Sta 6798+66.04 to 6801+22.33
EB Sta 6825+76.59 to 6829+92.05

TYPICAL MAINLINE SECTION



WB Sta 6803+14.36 to 6805+65.00
WB Sta 6826+60.24 to 6828+25.94

EB Sta 6801+22.33 to 6803+56.69
EB Sta 6822+73.95 to 6825+76.59

TYPICAL MAINLINE SECTION

▨ Mill Existing 2" AR-ACFC

	NAME	DATE
DESIGN	J. ROBERTS	02/08
DRAWN	E. ELY	02/08
CHECKED	B. DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

DWG NO. C-03.14

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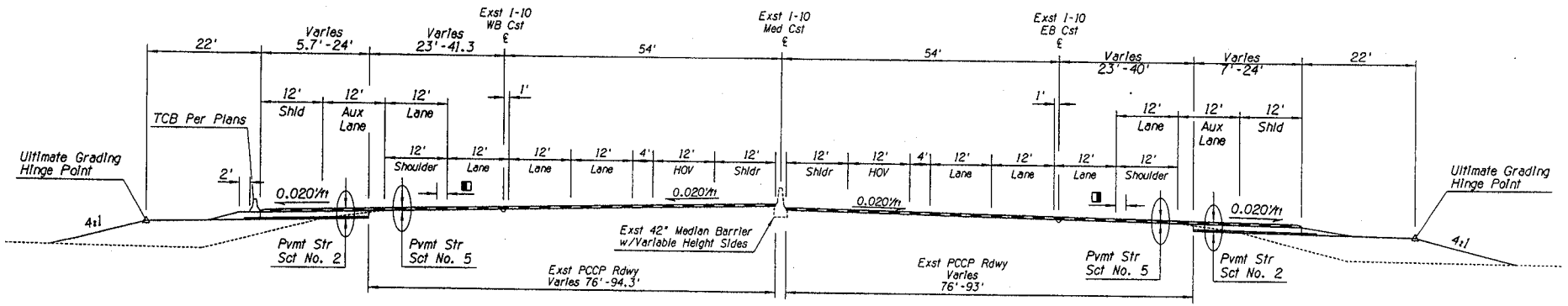
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



WB Sta 6805+65.00 to 6826+60.24

EB Sta 6803+56.69 to 6822+73.95

TYPICAL MAINLINE SECTION

◧ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	G-03.15

TRACS NO. H7296 01C ____ OF ____

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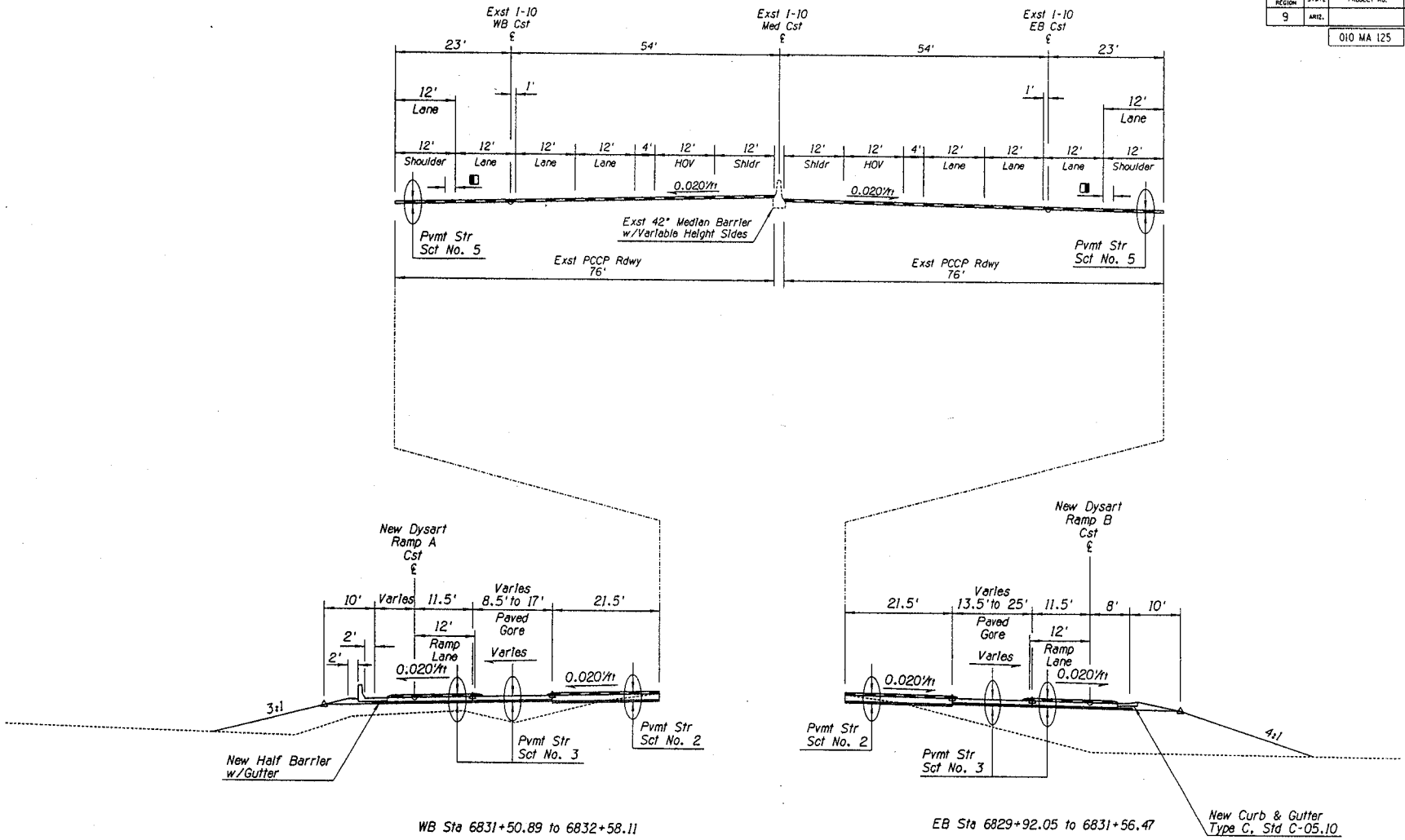
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



WB Sta 6831+50.89 to 6832+58.11

EB Sta 6829+92.05 to 6831+56.47

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC.

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEMN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-03.16

TRACS NO. H7296 01C

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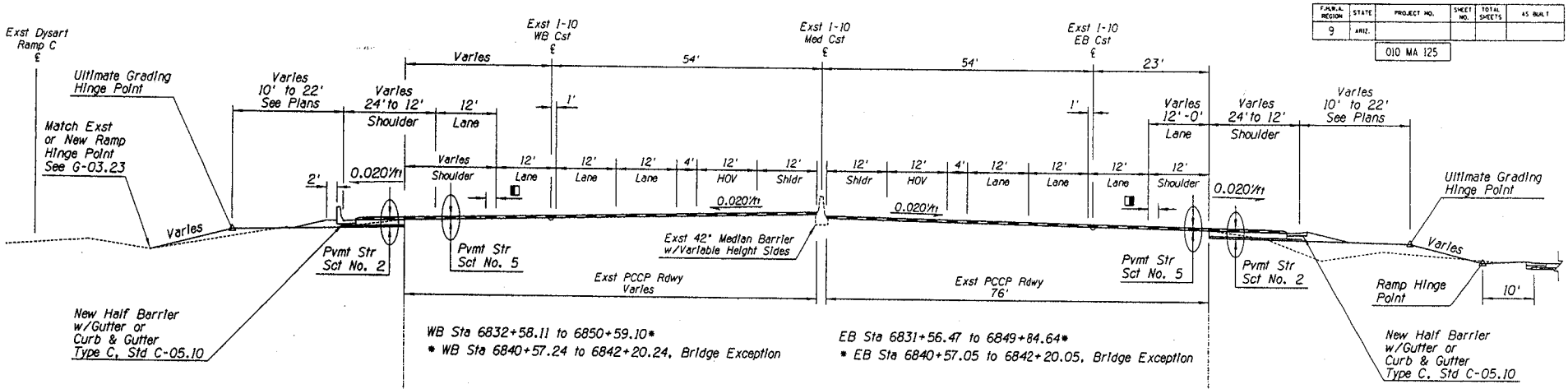
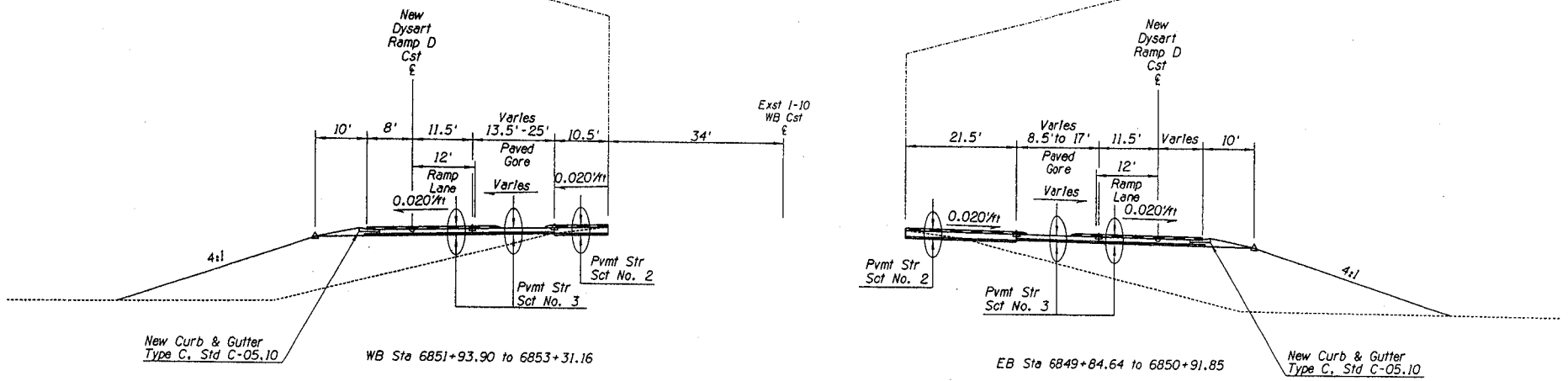
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				
		010 MA 125			



TYPICAL MAINLINE SECTION



TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.17

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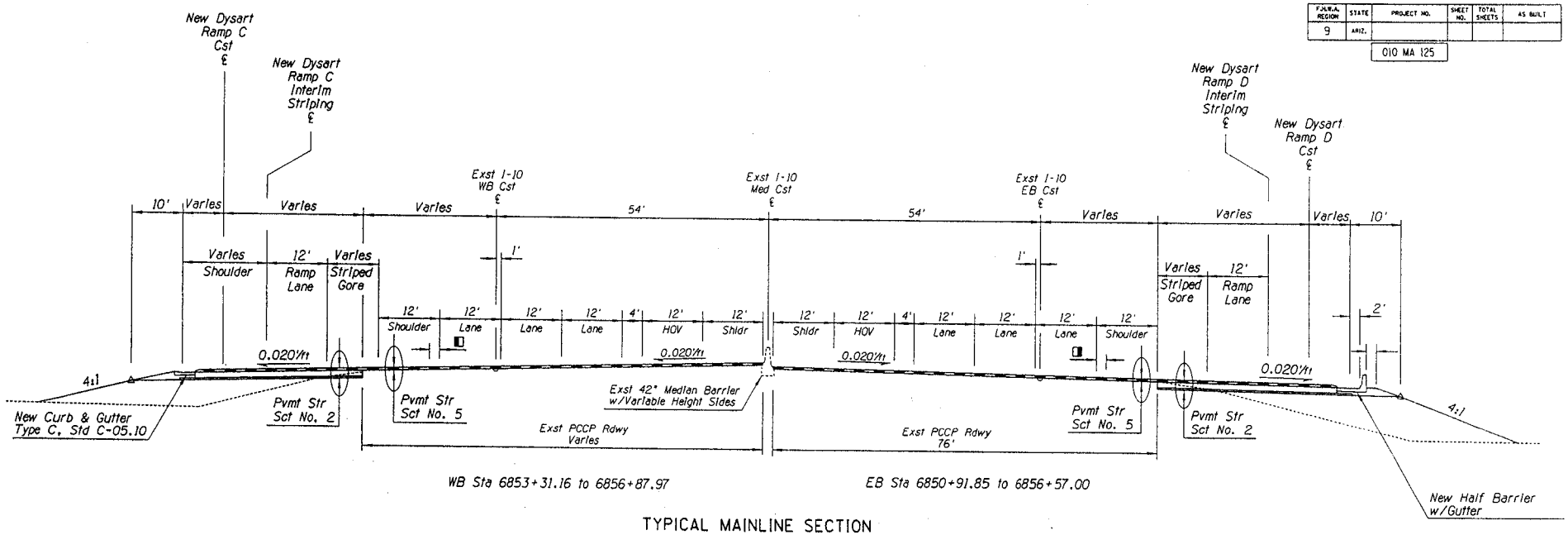
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



WB Sta 6853+31.16 to 6856+87.97

EB Sta 6850+91.85 to 6856+57.00

TYPICAL MAINLINE SECTION

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

DWG NO G-03.18

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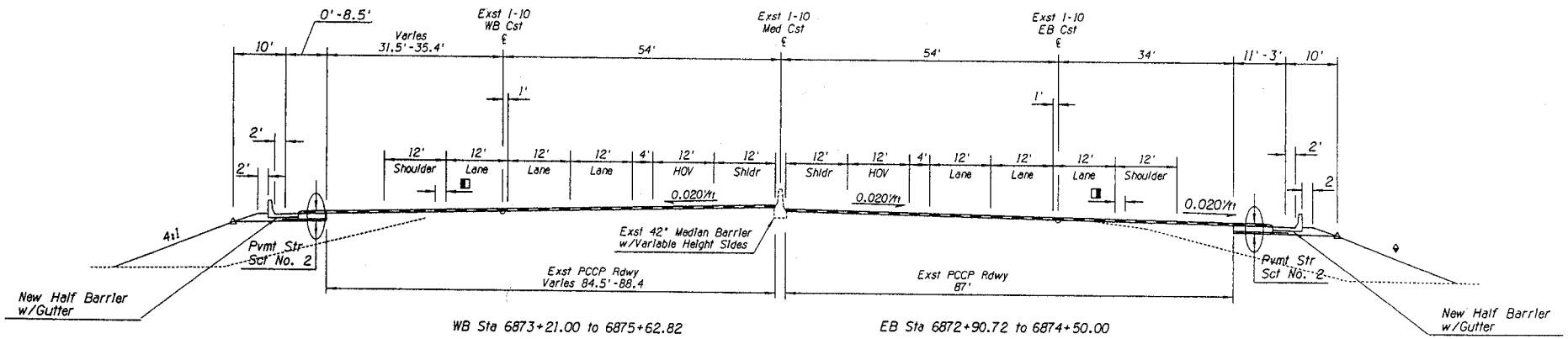
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

010 MA 125



TYPICAL MAINLINE SECTION

◆ See Slope Exception Table

◨ Mill Existing 2' AR-ACFC

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
TYPICAL SECTIONS

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-03.19

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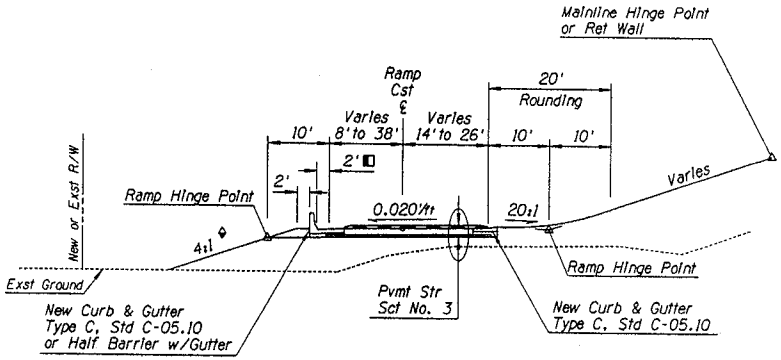
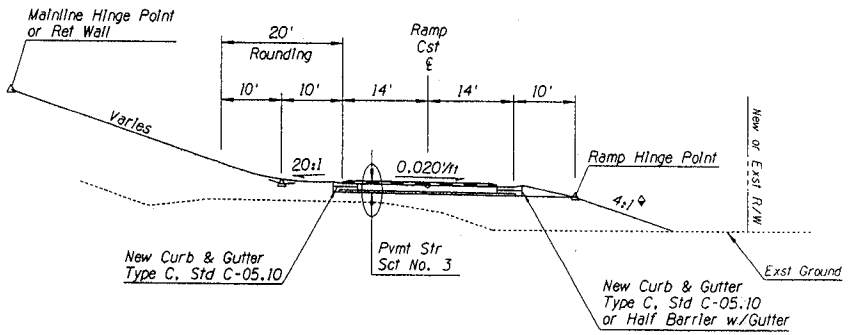
FEDERAL REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				
		010 MA 125			

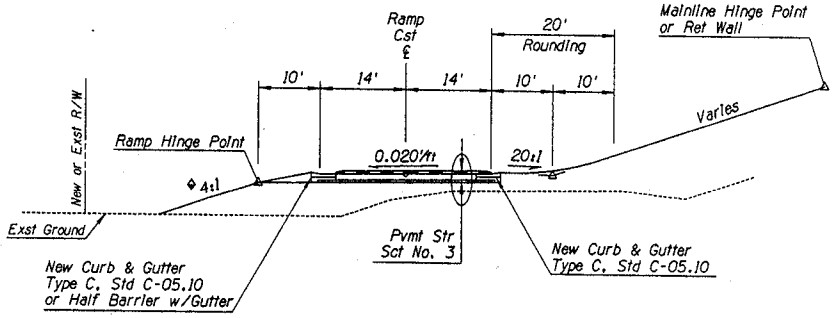


TYPICAL SECTION - WB EXIT RAMP

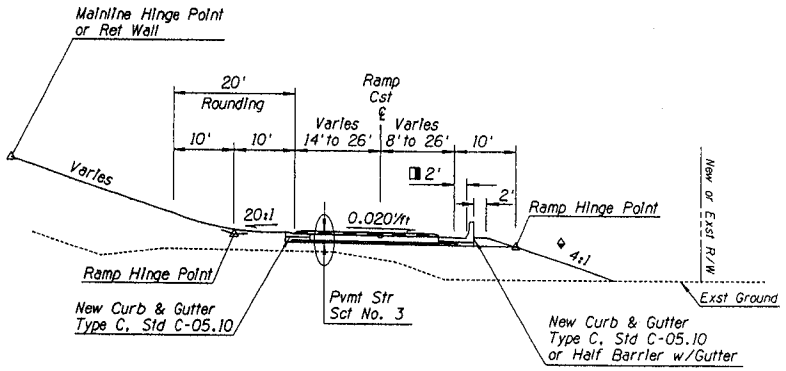
Lane Configuration Varies at Each TI But Provides Four Lanes at Termini



TYPICAL SECTION - EB ENTRANCE RAMP



TYPICAL SECTION - WB ENTRANCE RAMP



TYPICAL SECTION - EB EXIT RAMP

Lane Configuration Varies at Each TI But Provides Three Lanes at Termini

◆ *See Slope Exception Table*

◧ *Add Additional Two Feet To Gutter On Ramps Where Barrier Is Present. Does Not Affect Location of Hinge Point.*

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

DESIGN SHEET
TYPICAL SECTIONS

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO C-03.20

TRACS NO. H7296 01C

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APPENDIX B

ROADWAY DRAINAGE SYSTEM PLANS & PROFILES

(STAGE III)

NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

NRCP NRCIPCP CHDPEEP

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP				CAP		RCP					END TREATMENT														QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating			In.					In.		Each		Catch basin, Manhole, Headwall & Junction Structure														
																		End Sec	Ea				Ft.			Grate		Ft.					
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (in) Manhole	Standard or Detail	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Inlet Depression In.	Inlet Depression Ft.	L (0.0)	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
I-10 EB Sta 6665+75 81.68' Rt	100			24	10																	1		C-15.92			4.0		20			1010.98	1	2.5					CB100 to Outlet
to Sta 6665+75 103' Rt																																								
I-10 WB Sta 6667+48.52 80.5'	102			24	12																	1		C-15.91			4.5		25			1011.57	1	2.5					CB102 to Outlet
Lt to Sta 6667+48.52 96' Lt																																								
I-10 EB Sta 6667+80 88.36' Rt	104			24	14																	1		C-15.92			4.5		30			1011.62	1	2.5					CB104 to Outlet
to Sta 6667+80 105.68' Rt																																								
I-10 WB Sta 6670+20 84.93' Lt	106			24	23																	1		C-15.91			5.0		45			1013.75	1	2.5					CB106 to Outlet
to Sta 6670+20 111' Lt																																								
I-10 EB Sta 6670+50 102.77' Rt	108			24	41																	1		C-15.92			4.5		30			1013.68	1	2.5					CB108 to Outlet
to Sta 6670+50 155' Rt																																								
I-10 EB Sta 6672+06.50 89' Rt	110			24	31																																			Pipe Crossing Under Ramp B
to Sta 6672+06.50 120' Rt																																								
I-10 WB Sta 6673+69.70 80' Lt	112			24	37																																			Pipe Crossing Under Ramp A
to Sta 6673+69.70 117' LT																																								
I-10 EB Sta 6678+83 32.5' Rt	114			24																				C-15.92			5.0		20/15			1024.11	1	2.5					CB110 to Infield Area
to Sta 6678+83 _.' Rt																																								
I-10 WB Sta 6686+92 32.5' Lt	116			24	208																				C-15.92			5.5		20			1024.24	1	2.5					CB116 to Infield Area
to Sta 6686+92 241.75' Lt																																								
Sheet Total																						5								205										

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHALIB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-05.01

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.A.H.R.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	CSP: Corrugation	CSP: Wall Thickness (0.00)	CSP: Coating: Zinc	CSP: Coating: Bit. Coated Zinc	CSP: Coating: Aluminum	CSP: Coating: Bit. Coated Aluminum	CAP: Corrugation	CAP: Wall Thickness (0.00)	CAP: Coating: Uncoated	CAP: Coating: Bit. Coated	RCP: Class - Non Trench	RCP: Class - Trench	RCP: Class	RCP: Min Wall Thickness (0)	NRCP: AASHTO M-294 Type C	NRCIPCP: AASHTO M-294 Type S	CHDPEPP: C-13.20 & C-13.25	End Sec: Detail - Size, (in) Manhole	Each: Standard or Detail	Each: S-Single / D-Double	Each: Location	Each: H (0.0)	Each: L Wing (0.0)	Ft.: L 18" Slotted Drn (0)	Ft.: L 24" Slotted Drn (0)	Grate: Type	Grate: Elev. (0.00)	Inlet Depression: Depth	Inlet Depression: L (0.0)	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
				In.	In.	Ft.	Degree	In.	Coating				In.								In.				Each		Catch basin, Manhole, Headwall & Junction Structure				Ft.		Grate		Ft.						Cubic Yard	
I-10 EB Sta 6692+08.74 69' Rt	118			24	38																																		Pipe Crossing Under Ramp D
to Sta 6692+08.74 107' Rt																																							for Future Catch Basin
I-10 EB Sta 6697+52 118.09' Rt	119			36	263																1																	Pipe 119 to MH121
to Sta 6700+14 91.95' Rt																																							
I-10 EB Sta 6695+75 71.00' Rt	120			24	52																1			C-15.92			5.0		25			1012.43	1	2.5					CB120 to Outlet
To Sta 6695+75 124.5' Rt																																							
I-10 EB Sta 6700+14 91.95' Rt to	121			36	262																			C-18.10			8.0					999.30							MH121 to MH125
Sta 6702+76 91.78' Rt																																							
I-10 WB Sta 6699+75 74.12' Lt	122			24	53																1			C-15.92			5.0		50			1005.04	1	2.5					CB122 to Outlet
to Sta 6699+75 129.5' Lt																																							
I-10 EB Sta 6700+14 68.5' Rt to	124			24	18																			C-15.92			7.0		45			1004.60	1	2.5					CB124 to MH121
Sta 6700+14 91.95' Rt																																							
I-10 EB Sta 6702+76 91.78Rt to	125			36	262																			C-18.10			5.4					995.50							MH125 to MH127
Sta 6705+38 91.61' Rt																																							
I-10 WB Sta 6706+87.53 68.5' Lt	126			24	25																1			C-15.92			5.0		45			997.54	1	2.5					CB126 to Outlet
to Sta 6706+87.53 97.0' Lt																																							
I-10 EB Sta 6705+38 91.61' Rt to	127				262																			C-15.80			4.4					993.40							MH127 to MH129
Sta 6707+21.19 91.49' Rt																																							
Sheet Total																					4							165											

FILL HEIGHT RANGE TABLE (Ft.)

RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION

A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-05.02

___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHOPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

Station	Plan Ref No.	Controlling Fill Height Range	DESCRIPTION: Size, Corrugated (In.)	Size, Smooth (In.)	Length (0) (Ft.)	Skew (0) (Degree)	CSP: Corrugation	CSP: Wall Thickness (0.00) (In.)	CSP Coating: Zinc	CSP Coating: Bit. Coated Aluminum	CSP Coating: Bit. Coated Aluminum	CAP: Corrugation	CAP: Wall Thickness (0.00) (In.)	CAP Coating: Uncoated	CAP Coating: Bit. Coated	RCP: Class - Non Trench	RCP: Class - Trench	RCP: Class	NRCP: Min Wall Thickness (0) (In.)	CHDPEPP: AASHTO M-294 Type C	CHDPEPP: AASHTO M-294 Type S	CHDPEPP: C-13.20 & C-13.25 Detail -	END TREATMENT: Size, (In) Manhole Standard or Detail (Each)	End Sec (Ea)	Catch basin, Manhole, Headwall & Junction Structure: S-Single / D-Double	Location	H (0.0) (Ft.)	L Wing (0.0) (Ft.)	L 18" Slotted Drn (0) (Ft.)	L 24" Slotted Drn (0) (Ft.)	Type	Elev. (0.00) (Ft.)	Grate: Depth (Ft.)	Grate: Inlet Depression L (0.0) (In.)	Grate: Inlet Depression Depth (Ft.)	Pipe Exc (0) (Cubic Yard)	Pipe Bk-fl (0) (Cubic Yard)	Drn Exc (0) (Cubic Yard)	Berm/Dike Emb (0) (Cubic Yard)	REMARKS
I-10 EB Sta 6707+21.18 68.5' Rt	128			24	20																		C-15.92				5.0	45				997.47	1	2.5					CB128 to Outlet
to Sta 6707+21.18 91.49' Rt																																							
I-10 EB Sta 6707+21.19 91.49' Rt	129			30																	1		C-18.10									991.90							MH129 to Bullard Wash
to Sta																																							
I-10 EB Sta 6710+40.25 68.5' Rt	130			24	38																1		C-15.91				5.0	30/10				996.71	1	2.5					CB130 to Outlet
to Sta 6710+40.25 ' Rt																																							
I-10 WB Sta 6710+49.64 68.5' Lt	132			24	31																1		C-15.92				5.0	20/15				996.56	1	2.5					CB132 to Outlet
to Sta 6710+49.64 102.5' Lt																																							
I-10 WB Sta 6715+52.8 54.5' Lt	134			24	62																1																		Extend Existing Storm Drain to
to Sta 6715+52.8 126' Lt																																							Ditch 'D'
I-10 EB Sta 6715+80 68.5' Rt to	136			24	31																1		C-15.91				5.5	20/15				997.60	1	2.5					CB136 to Outlet
Sta 6715+80 102' RT																																							
I-10 EB Sta 6719+10 68.5' Lt to	138			24	39																1		C-15.91				5.5	30				1000.94	1	2.5					CB138 to Drainage Ditch
Sta 6719+10.110.5' Lt																																							
I-10 WB Sta 6719+30 60.9' Lt	139			24	76																1																		Extend Storm Drain to Ditch 'D'
Sta 6719+30 146' Lt																																							
I-10 EB Sta 6722+40 76.81' Rt to	140			24	51																1		C-15.91				5.5	30				1005.47	1	2.5					CB140 to Drainage Ditch 'D'
Sta 6722+40 130.5' Rt																																							
Sheet Total																					8							215											

FILL HEIGHT RANGE TABLE (Ft.)

RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION

A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO G-05.03

____ OF ____

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

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CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP					CAP			RCP		NRCP	NRCIPCP	CHDPEPP	END TREATMENT														QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating				In.					In.			Each	Catch basin, Manhole, Headwall & Junction Structure														Cubic Yard	
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (in) Manhole	End Sec	Standard or Detail	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	Ea	Ft. L 18° Slotted Drn (0)	Ft. L 24° Slotted Drn (0)	Type	Grate Elev. (0.00)	Grate Ft. Depth	Grate Ft. L (0.0)	Inlet Depression	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike End (0)	REMARKS
I-10 WB Sta 6723+50 87.5' Lt to	146			24	109																		1																				
Sta 6723+50 195' Lt																																													Ditch 'D'
I-10 EB Sta 6725+12.15 56.5' Rt	148			24	104																		1		C-15.91			6.0		30				1010.52	1	2.5						CBI48 to Outlet
to Sta 6725+12.15 171' Rt																																												
I-10 WB Sta 6728+40 37' Lt to	150			24	25																																							Existing Pipe to New Retaining
Sta 6728+40 61.3' Lt																																													Wall 2
I-10 EB Sta 6729+65 51.2' Rt to	152			18	8																				C-15.92			5.0		30				1016.03	1	2.5						CBI52 to Bullard Ave
Sta 6729+65 55.7' Rt																																													Ramp B Infield Area
I-10 EB Sta 6740+30 44.5' Rt to	154			24	2																				C-15.92			6.5		40				1016.46	1	2.5						CBI54 To Bullard Ave
Sta 6740+30 49.5' Rt																																													Ramp D Infield Area
I-10 WB Sta 6740+30 44.5' Lt to	156			18	4																				C-15.92			5.0		40				1016.64	1	2.5						CBI56 to Bullard Ave
Sta 6740+30 49.5' Lt																																													Ramp C Infield Area
I-10 EB Sta 6746+09 44.5' Rt	158			24	115																				C-15.91			5.5		40				1008.26	1	2.5						CBI58 to MHI61
Sta 6747+25 52.5' Rt																																													
I-10 EB Sta 6747+48 44.5' Rt	160			24	23																				C-15.91			6.0		40				1006.36	1	2.5						CBI60 to MHI61
to Sta 6747+25 52.5'Rt																																													
I-10 EB Sta 6747+25 52.5' Rt to	161			24	16																				C-18.10			7.0						1006.70								MHI61 to Existing 24" RCP
Sta 6747+25 37' Rt																																												
Sheet Total																							2							220												

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90
SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.													

PIPE CORRUGATION				
A	2⅔x½	D	6x2	
B	3x1	E	3x1 or 9x2½	
C	9x2½			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO.	H7296 01C	010-B(202)

DWG NO C-05.04

SHEET NO. ___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
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CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	DESCRIPTION						CSP						CAP			RCP	NRCIPCP	CHDPEPP	END TREATMENT														QUANTITIES	
				In.	In.	Ft.	Degree	In.	Coating				In.				In.		Each	Catch basin, Manhole, Headwall & Junction Structure														Cubic Yard	
																			Ea			Ft.			Grate		Ft.						
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (in) Manhole	Standard or Detail	End Sec	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18' Slotted Drn (0)	L 24' Slotted Drn (0)	Type	Elev. (0.00)	Depth	L (0.0)	Inlet Depression	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
I-10 WB Sta 6746+89.63 44.5' Lt	162			24	34																				C-15.91				5.5					1007.22	1	2.5						CBI62 to MHI63
to Sta 6747+25 52' Lt																																										
I-10 WB Sta 6747+25 52.5' Lt to	163			24	73																		1		C-18.10				9.1					1006.70								MHI63 to FCDMC
Sta 6775+25 127' Lt																																										Regional Retention Basin
I-10 WB Sta 6751+25 60.41' Lt	164			24	77																		1		C-15.92				7.0		25			999.53	1	2.5						CBI64 to Outlet
to Sta 6754+25 140.5' Lt																																										
I-10 WB Sta 6754+87.55 56.5' Lt	166			24	81																		1		C-15.92				7.0		40			997.92	1	2.5						CBI66 to Outlet
to Sta 6754+87.55 140.5' Lt																																										
I-10 WB Sta 6755+09.39 44.5' Lt	168			24	92																		1		C-15.92				6.0		15			998.40	1	2.5						Extension of Pipe 168
to Sta 6755+09.39 138.5' Lt																																										
I-10 WB Sta 6759+81.32 44.5' Lt	170			24	96																		1		C-15.92				7.5		30			1001.29	1	2.5						Extension of Pipe 170
to Sta 6759+81.32 142'Lt																																										
I-10 WB Sta 6763+70.12 44.5' Lt	172			24	126																		1		C-15.92				7.7		35			1006.59	1	2.5						Extension of Pipe 172
to Sta 6763+70.12 159' Lt																																										
I-10 EB Sta 6772+33.3 57.9' Rt	174			24																					C-15.91									1013.42	1	2.5						CBI74 to CBI76
to Sta 6771+88.3 56.5' Rt																																										
I-10 EB Sta 6771+88.3 56.5' Rt	176			24	100																		1		C-15.91				6.0		20			1014.43	1	2.5						CBI76 to Outlet
to Sta 6771+88.3 154.25' Rt																																										
Sheet Total																							7							165											

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90
◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.													

◪ PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

DWG NO G-05.05

SHEET NO. OF

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
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SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

Station	Plan Ref No.	Controlling Fill Height Range	DESCRIPTION: Size, Corrugated In.	Size, Smooth In.	Length (0) Ft.	Skew (0) Degree	CSP: Corrugation	CSP: Wall Thickness (0.00) In.	CSP: Coating: Zinc	CSP: Coating: Bit. Coated Zinc	CSP: Coating: Aluminum	CSP: Coating: Bit. Coated Aluminum	CAP: Corrugation	CAP: Wall Thickness (0.00) In.	CAP: Coating: Uncoated	CAP: Coating: Bit. Coated	RCP: Class - Non Trench	RCP: Class - Trench	RCP: Class	RCP: Min Wall Thickness (0) In.	NRCP: AASHTO M-294 Type C	NRCIPCP: AASHTO M-294 Type S	CHDPEPP: C-13.20 & C-13.25	End Sec: Detail - Size, (In) Manhole	End Sec: Standard or Detail	End Sec: S-Single / D-Double	Catch basin, Manhole, Headwall & Junction Structure: Location	H (0.0) Ft.	L Wing (0.0) Ft.	L 18" Slotted Drn (0) Ft.	L 24" Slotted Drn (0) Ft.	Type	Elev. (0.00) Grate	Inlet Depression: Depth In.	Inlet Depression: L (0.0) Ft.	Pipe Exc (0) Cubic Yard	Pipe Bkfl (0) Cubic Yard	Drn Exc (0) Cubic Yard	Berm/Dike Emb (0) Cubic Yard	REMARKS
I-10 WB Sta 6772+62.93 54.5' Lt	178			24	68																			C-15.92				5.5		25			1013.48	1	2.5					CB178 to CB179
to Sta 6772+62.93 120.52' Lt																																						
I-10 WB Sta 6772+62.93 ..' Lt	179			18	2																			D-				2.0					995.10							CB179 to Outlet
to Sta 6772+62.93 ..' Lt																																						
I-10 EB Sta 6775+00 70.15' Rt	180			24	104																		1	C-15.92				5.5		35			1015.04	1	2.5					CB180 to Outlet
to Sta 6775+00 174' Rt																																						
	181			36																			1																	Extension of 36" RCP
																																						Irrigation Line
I-10 WB Sta 6775+00 58.66' Lt	182			24	61																			C-15.92				5.5		35			1015.56	1	2.5					CB182 to CB183
to Sta 6775+00 119' Lt																																						
I-10 WB Sta 6775+00 ..' Lt to	183			18	3																			D-				2.0					997.79							CB183 to Outlet
Sta 6775+00 ..' Lt																																						
I-10 EB Sta 6778+03.03 76' Rt to	184			24	36																																	Pipe for Future Catch Under
Sta 6778+03.03 111.5' Rt																																						Litchfield Road Ramp B
	185			36																			1																Extension of 36" RCP
																																						Irrigation Line
I-10 WB Sta 6778+50.80 54' Lt	186			24	80																																	Pipe for Future Catch Under
to Sta 6778+50.80 133.09' Lt																																						Litchfield Road Ramp A
Sheet Total																							3							95									

FILL HEIGHT RANGE TABLE (Ft.)												
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	C-05.06

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
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CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	DESCRIPTION						CSP			CAP		RCP	NRCP	NRCIPCP	CHDPEPP	END TREATMENT															QUANTITIES	
				In.	In.	Ft.	Degree	In.	Coating		In.		In.			Each	Ea	Catch basin, Manhole, Headwall & Junction Structure			Ft.		Grate	Ft.						Cubic Yard	
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	C-13.20 & C-13.25	Detail -	Size, (In) Manhole	End Sec Standard or Detail	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Depth	L (0.0)	Inlet Depression	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
I-10 WB Sta 6778+50.80 54' Lt	186			24	80																																		Pipe for Future Catch Under
to Sta 6778+50.80 133.09' Lt																																							Litchfield Road Ramp A
I-10 WB Sta 6778+50.80 133.09'	187			18	12																		D-			5.0				1005.52								CB187 to Existing FCDMC
Lt to Sta 6778+50.80 _.' Lt																																							Regional Retention Basin
I-10 EB Sta 6787+65.41 32.5' Rt	188			24	110																		C-15.92			5.5		30		1013.69	1	2.5						CB188 to MH189
to Sta 6787+65.41 145' Rt																																							
I-10 EB Sta 6787+65.41 145' Rt	189			24	54																		C-18.10			6.1				990.10								CB189 to Exsting Catch Basin
to Sta 6788+21.21 148.69' Rt																																							
I-10 EB Sta 6790+73 44.5' Rt to	190			24	97																		C-15.92			5.0		50		1007.39	1	2.5						CB190 to MH191
Sta 6790+73 142.93' Rt																																							
I-10 EB Sta 6790+73 142.93' Rt	191			24	72																		C-18.10			5.6				987.60								MH191 to Existing Catch Basin
to Sta 6790+01.40 146.01' Rt																																							
I-10 WB Sta 6791+00 43.25' Lt	192			24	76																	1	C-15.92			5.0		35		1007.16	1	2.5						CB192 to Outlet
to Sta 6791+00 121' Lt																																							
I-10 EB Sta 6797+41.71 32.5' Rt	194			24	80																	1	C-15.91			5.0		50		995.53	1	2.5						CB194 to outlet
to Sta 9797+41.71 115.5' Rt																																							
I-10 WB Sta 6797+39 32.5' Lt to	196			24	160																	1	C-15.91			5.5		45		995.64	1	2.5						CB196 to Exst FCDMC
Sta 6797+39 197.5' Lt																																							Regional Retention Basin
Sheet Total																						3						210											

FINISHED PLANS — DATE — LOCATION — REVISIONS — FINISHED PLANS — SURVEY NO.

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO G-05.07

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated (In.)	Size, Smooth (In.)	Length (0) (Ft.)	Skew (0) (Degree)	CSP: Corrugation	CSP: Wall Thickness (0.00)	CSP: Coating: Zinc	CSP: Coating: Bit. Coated Zinc	CSP: Coating: Aluminum	CSP: Coating: Bit. Coated Aluminum	CAP: Corrugation	CAP: Wall Thickness (0.00)	CAP: Uncoated	CAP: Bit. Coated	RCP: Class - Non Trench	RCP: Class - Trench	RCP: Class	NRCP: Min Wall Thickness (0) (In.)	NRCIPCP: AASHTO M-294 Type C	NRCIPCP: AASHTO M-294 Type S	CHDPEPP: C-13.20 & C-13.25	End Sec: Detail - Size, (In) Manhole	End Sec: Standard or Detail	End Sec: S-Single / D-Double	Catch basin, Manhole, Headwall & Junction Structure: Location	H (0.0) (Ft.)	L Wing (0.0) (Ft.)	L 18" Slotted Drn (0) (Ft.)	L 24" Slotted Drn (0) (Ft.)	Type	Elev. (0.00) (Grate)	Depth (Ft.)	Inlet Depression: L (0.0) (In.)	Inlet Depression: Pipe Exc (0) (Ft.)	Inlet Depression: Pipe Bk fl (0) (Ft.)	Inlet Depression: Drn Exc (0) (Ft.)	Inlet Depression: Berm/Dike Emb (0) (Ft.)	REMARKS
I-10 EB Sta 6803+54.69 56.5' Rt	200			24																			1		C-15.91				25			989.69	1	2.5					CB200 to New Retention
to Sta 6803+54.69 _.' Rt																																								Basin
I-10 WB Sta 6805+54.18 56.5' Lt	202			24	73																		1		C-15.92		6.5		40			989.43	1	2.5					CB202 to Exst FCDMC
to Sta 6805+54.18 132' Lt																																								Regional Retention Basin
I-10 EB Sta 6822+75.95 56.5' Rt	204			24																			1		C-15.91		5.5		35			993.27	1	2.5					CB204 to New Retention
to Sta 6822+75.95 _.' Rt																																								Basin
I-10 EB Sta 6825+30 56.5' Rt	206			24																			1		C-15.91		5.5		35			993.95	1	2.5					C206 to New Retention
to Sta 6825+30 _.' Rt																																								Basin
I-10 WB Sta 6826+62.24 56.5' Lt	208			24	120																		1		C-15.92		6.0		45			994.95	1	2.5					CB208 to Existing FCDMC
to Sta 6826+62.24 178.5' Lt																																								Regional Retention Basin
I-10 EB Sta 6828+10 65.05' Rt	210			24	20																		1		C-15.91		5.5		35			995.66	1	2.5					CB210 to New Retention
to Sta 6828+10 88.55' Rt																																								Basin
I-10 EB Sta 6831+73.47 32.5' Rt	212			24	95																		1		C-15.91		5.5		40			1000.68	1	2.5					CB212 to New Retention
to Sta 6831+73.47 130' Rt																																								Basin
I-10 WB Sta 6832+75.11 32.5' Lt	214			24	196																		1		C-15.91		5.5		40			1002.96	1	2.5					CB214 to Existing FCDMC
to Sta 6832+75.11 229.6' Lt																																								Regional Retention Basin
I-10 EB Sta 6836+90 32.5' Rt to	216			24	133																		1		C-15.92		5.5		40			994.95	1	2.5					CB216 to Outlet
Sta 6836+90 167' Rt																																								
Sheet Total																							9						335										

FILL HEIGHT RANGE TABLE (Ft.)

RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION

A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	W WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C		010-B(202)

DWG NO G-05.08

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHOPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP					CAP			RCP	NRCP	NRCIPCP	CHDPEPP	END TREATMENT														QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating				In.			In.				Each	Catch basin, Manhole, Headwall & Junction Structure														Cubic Yard
																			Ea			Ft.			Grate	Ft.							
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (in) Manhole	Standard or Detail	End Sec	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Depth	Inlet Depression L (0.0)	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
I-10 WB Sta 6836+90 32.5' Lt	218			24	147																				C-15.91				5.5		40			1010.15	1	2.5					CB218 to Existing FCDMC
to Sta 6836+90 177' Lt																																									Regional Retention Basin
I-10 WB Sta 6836+90 182' Lt	219			24	112																		1		C18.10				6.0					990.30							MH219 to FCDMC Regional
to Sta 6836+30.27 277.73' Lt																																									Retention Basin
I-10 EB Sta 6845+75 35.5' Rt to	220			24	113																		1		C-15.91				6.0		35			1010.70	1	2.5					CB220 to Dysart Road
Sta 6845+78 148.5' Rt																																									Ramp D Infield Area
I-10 WB Sta 6845+85 32.5' Lt	222			24	63																		1		C-15.92				5.5		35			1010.90	1	2.5					CB222 to Dysart Road
to Sta 6845+85 97' Lt																																									Ramp C Infield Area
I-10 WB Sta 6849+28 32.76' Lt	224			24	27																		1		C-15.92				5.5		35			1005.24	1	2.5					CB224 to Dysart Road
to Sta 6849+28 63.26' Lt																																									Ramp C Infield Area
I-10 EB Sta 6849+67.64 32.5' Rt	226			24																			1		C-15.91				5.5					1004.57	1	2.5					CB226 to Outlet
to Sta 6849+67.64 _.' Rt																																									
I-10 WB Sta 6851+76.90 32.5' Lt	227			24																			1		C-15.90						30			1001.40	1	2.5					CB227 to Drainage Ditch
to Sta 6851+76.90 _.' Lt																																									
I-10 EB Sta 6852+80 59.27 Rt	228			24																					C-15.92						40			999.67	1	2.5					CB228 to MH229
to Sta 6852+80 _.' Rt																																								
I-10 WB Sta 6854+00 69.88' Lt	230			24																			1		C-15.92						30			998.27	1	2.5					CB230 to Drainage Ditch
to Sta 6854+00 _.' Lt																																								
Sheet Total																							7								245										

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. C-05.09

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP					CAP				RCP		NRCP	NRCIPCP	CHDPEPP	END TREATMENT												QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating				In.						In.			Each	Catch basin, Manhole, Headwall & Junction Structure											Cubic Yard	
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (In) Manhole	Standard or Detail	End Sec	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Grate Depth In.	Grate L (0.0) Ft.	Inlet Depression	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
																										Ea		Ft.				Ft.								
I-10 EB Sta 6856+48 44.85' Rt	232			24																				C-15.92						30			997.09	1	2.5					CB232 to MH233
to Sta 6856+48 ..' Rt																																									
I-10 WB Sta 6856+70.97 51.52' Lt	234			24																		1		C-15.91				5.5		30			997.11	1	2.5					CB234 to Drainage Ditch
to Sta 6856+70.97 ..' Lt																																									
101 EB Sta 6874+26.06 40.24' Rt	236			24																		1		C-15.92						25				1	2.5					CB236 to Outlet
to Sta 6874+26.06 ..' Rt																																									
I-10 WB Sta 6874+76.13 40.21' Lt	238			24																		1		C-15.92						25				1	2.5					CB238 to Outlet
to Sta 6874+76.13 ..' Lt																																									
Est Pky Rp A Sta 13+20 31.5' Rt	300			24	8																																			Stubout to CB302
to Sta 13+20 11.5' Lt																																									
Estr Pky Rp A Sta 13+20 25.5'	302			24	34																			C-15.81				4.0					1015.00							CB302 to CB304
Rt to sta 13+20 11.5' Lt																																									
Estr Pky Rp A Sta 13+20 11.5'	304			24	40																		1		C-15.91				4.5		20			1014.83	1	2.5					CB304 to Outlet
Lt to Sta 13+20 54.5' Lt																																									
Estr Pky Rp A Sta 16+81.20	306			24	36																			C-15.81				3.0					1006.17							CB306 to CB308
27.65' Rt to Sta 16+81.20 11.5' Lt																																									
Estr Pky Rp A Sta 16+81.2 11.5'	308			24	47																			C-15.91				3.4		25			1006.10	1	2.5					CB308 to CB309
Lt to Sta 16+91.43 60.85' Lt																																									
Sheet Total																						4									155									

FILL HEIGHT RANGE TABLE (Ft.)												
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION				
A	2⅔x½	D	6x2	
B	3x1	E	3x1 or 9x2½	
C	9x2½			

	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C		010-B(202)

DWG NO C-05.10
___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated (In.)	Size, Smooth (In.)	Length (0) (Ft.)	Skew (0) (Degree)	CSP: Corrugation	CSP: Wall Thickness (0.00)	CSP: Coating: Zinc	CSP: Coating: Bit. Coated Zinc	CSP: Coating: Aluminum	CSP: Coating: Bit. Coated Aluminum	CAP: Corrugation	CAP: Wall Thickness (0.00)	CAP: Coating: Uncoated	CAP: Coating: Bit. Coated	RCP: Class - Non Trench	RCP: Class - Trench	RCP: Class	NRCP: Min Wall Thickness (0) (In.)	CHDPEPP: AASHTO M-294 Type C	CHDPEPP: AASHTO M-294 Type S	END TREATMENT: End Sec (Each)	END TREATMENT: Catch basin, Manhole, Headwall & Junction Structure: Detail - Size, (In) Manhole (Ea)	Standard or Detail	S-Single / D-Double	Location	H (0.0) (Ft.)	L Wing (0.0) (Ft.)	L 18" Slotted Drn (0) (Ft.)	L 24" Slotted Drn (0) (Ft.)	Type (Grate)	Elev. (0.00) (Ft.)	Inlet Depression: Depth (In.)	Inlet Depression: L (0.0) (Ft.)	QUANTITIES: Pipe Exc (0) (Cubic Yard)	Pipe Bkfl (0) (Cubic Yard)	Drn Exc (0) (Cubic Yard)	Berm/Dike Emb (0) (Cubic Yard)	REMARKS
Estr Pky Rp B Sta 15+63 28.5' Lt to Sta 15+63 24' Lt	309			24	5																			C-15.80								1004.70							Pipe Stubout to CB310
Est Pky Rp B Sta 15+63 24' Lt to Sta 15+63 5.5' Rt	310			24	28																			C-15.81				3.5				1011.37							CB310 to CB312
Est Pky Rp B Sta 15+63 5.5' Rt to Sta 15+63 49' Rt	312			24	41															1				C-15.91				4.5	25			1011.34	1	2.5					CB312 to Outlet
Est Pky Rp B Sta 19+41.49 28' Lt to Sta 18+41.49 23.50' Rt	314			24	50																			C-15.81				3.0				1003.75							CB314 to CB316
Est Pky Rp B Sta 19+41.49 23.5' Rt to Sta 19+41.49 37.5' Rt	316			24	11															1				C-15.91				4.0	30			1003.38	1	2.5					CB316 to Outlet
Est Pky Rp B Sta 2+39.92 27.47' Rt to Sta 2+39.92 35.5' Lt	318			24	60																			C-15.81				3.4				1006.55							CB318 to CB320
Est Pky Rp C Sta 2+39.92 35.5' Lt to Sta 2+39.92 47.5' Lt	320			24	9															1				C-15.91				3.4	40			1005.79	1	2.5					CB320 to Outfall
Est Pky Rp C Sta 7+00 29.5' Rt to Sta 7+00 25.5' Rt	322			24	6																																		Stubout to CB324
Est Pky Rp C Sta 7+00 25.5' Rt to Sta 7+00 37.5' Lt	324			24	60																			C-15.81				4.0				1014.72							CB324 to CB325
Sheet Total																				3									95										

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

DWG NO G-05.11 | ___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP			CAP		RCP				END TREATMENT													QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating		In.					In.	Each	Catch basin, Manhole, Headwall & Junction Structure												Cubic Yard	
																Ea			Ft.			Grate	Ft.							
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (In) Manhole	End Sec	Standard or Detail	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Depth	Inlet Depression L (0.0)	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Est Pky Rp C Sta 7+00 37.5' Lt	325			24	43																			C-15.91					5.0		20			1013.98	1	2.5					CB325 to MH702
to Sta 7+00 83.78' Lt																																									
Est Pky Rp C Sta 13+15.37 20'	326			24	33																																				Stubout to CB328
Rt to Sta 13+32 7.5' Lt																																									
Est Pky Rp C Sta 13+32.75 7.5'	328			24	62																			C-15.92					5.0		20			1013.01	1	2.5					CB328 to Pipe 706
Lt to sta 13+32.75 70.47' Lt																																									
Est Pky Rp D Sta 2+59 27.43' Lt	330			24	37																			C-15.81					3.7					1006.47							CB330 to CB332
to Sta 2+59 13.5' Rt																																									
Est Pky Rp D Sta 2+59 13.5' Rt	332			24	15																		1	C-15.92					4.0		25			1006.17	1	2.5					CB332 to Outlet
to Sta 2+59 32' Rt																																									
Est Pky Rp D Sta 6+50 30.5' Lt	334			24	7																																				Stubout to CB334
to Sta 6+50 25.5' Lt																																									
Est Pky Rp D Sta 6+50 25.5'	336			24	36																			C-15.81					5.0					1016.88							CB336 to CB338
Lt to Sta 6+50 13.5' Rt																																									
Est Pky Rp D Sta 6+50 13.5' Rt	338			24	53																		1	C-15.92					5.5		20			1016.62	1	2.5					CB338 to Outfall
to Sta 6+50 62' Rt																																									
Blrd Ave Rp A Sta 6+68.25 11.5'	400			24	101																		1	C-15.91					4.5		10			1009.79	1	2.5					CB400 to Outlet
Rt to Sta 6+68.25 87.5' Lt																																									
Sheet Total																							3								95										

FILL HEIGHT RANGE TABLE (Ft.)

RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION

A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO C-05.12

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP				CAP			RCP					END TREATMENT												QUANTITIES	
				In.	In.	Ft.	Degree	In.	Coating		In.						In.			Each		Catch basin, Manhole, Headwall & Junction Structure										Cubic Yard	
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (In) Manhole	Standard or Detail	End Sec	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18' Slotted Drn (0)	L 24' Slotted Drn (0)	Type	Elev. (0.00)	Grate Ft. Depth	Inlet Depression In.	Inlet Depression Ft.	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Bllrd Ave Rp A Sta 6+68.25 11.5' Rt to Sta 6+68.25 87.5' Lt	400			24	101																	1		C-15.91				4.5	10				1009.79	1	2.5						CB400 to Outlet
Bllrd Ave Rp A Sta 17+70 11.5' Rt to Sta 17+70 40' Lt	402			24	42																	1		C-15.91				3.5	25				997.12	1	2.5						CB402 to Outlet
Bllrd Ave Rp B Sta 12+35 14.83' Rt to Sta 12+35 61' Rt	404			24	44																	1		C-15.91				5.5	20				1003.12	1	2.5						CB404 to Outlet
Bllrd Ave Rp B Sta 13+25.22 11.5' Lt to Sta 13+25.22 51' Lt	406			24	37																	1		C-15.91				5.5	15				1001.51	1	2.5						CB406 to Existing Retention Basin
Bllrd Ave Rp B Sta 7+20 11.5' Lt to Sta 7+20 48.5' Lt	408			24	34																	1		C-15.91				5.5	20				1003.12	1	2.5						CB408 to Outfall
Bllrd Ave Rp C Sta 13+25.2 7.5' Lt to I-10 WB sta 6747+25.2 89.87' Lt	410			24	32																			C-15.91				5.5	15				1001.51	1	2.5						CB410 to Pipe 163 Prefabricated Tee Connection
Bllrd Ave Rp C Sta 8+17 11.5' Rt to Sta 8+17 36.5' Rt	412			24	22																	6		C-15.91				6.0	20				1001.91	1	2.5						CB412 to Outfall
Ltchfld Rd Rp A Sta 10+00 11.5' Lt to Sta 10+00 __.' Lt	500			24	45																			C-15.92				5.5	20				1014.91	1	2.5						CB500 to CB501
Ltchfld Rd Rp A Sta 10+00 __' Lt to Sta 10+00 __' Lt	501			18	8																			D-				5.0					1001.85								CB501 to Existing FCDMC Regional Retention Basin
Sheet Total																						6							145											

FILL HEIGHT RANGE TABLE (Ft.)

RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90

SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. C-05.13

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
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CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP						CAP						RCP	NRCP	NRCIPCP	CHDPEPP
Station	Plan Ref No.	● Controlling Fill Height Range	Size, Corrugated (In.)	Size, Smooth (In.)	Length (0) (Ft.)	Skew (0) (Degree)	◪ Corrugation	Wall Thickness (0.00) (In.)	Zinc	Blt. Coated Zinc	Aluminum	Blt. Coated Aluminum	◪ Corrugation	Wall Thickness (0.00) (In.)	Uncoated	Blt. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0) (In.)	AASHTO M-294 Type C	AASHTO M-294 Type S
Ltchfld Rd Rp A Sta 14+88 13.5'	502			24	75																	
Lt to Sta 14+88 99' Lt																						
Ltchfld Rd Rp B Sta 14+00 7.5'	504			24	65																	
Rt to Sta 14+00 73.5' Lt																						
Ltchfld Rd Rp B Sta 18+78 11.5'	506			24	49																	
Rt to Sta 18+76+54 36.43' Rt																						
Ltchfld Rd Rp C Sta 2+62 26'	508			24	12																	
Lt to Sta 2+62 40' Lt																						
Ltchfld Rd Rp C Sta 2+62 40'	510			24	60																	
Lt to Sta 2+62 101.36' Lt																						
Ltchfld Rd Rp C Sta 5+60 25.5'	512			24	84																	
Lt to Sta 5+60 112' Lt																						
Ltchfld Rd Rp D Sta 2+36.15	514			24	45																	
16.56' Rt to I-10 EB 6790+52.79																						
143.80' Rt																						
Dysart Rd Rp A Sta 14+34 11' Lt	600			24	29																	
to Sta 14+25.04 16.66' Rt																						
Dysart Rd Rp B Sta 18+43 11.84'	602																					
Sheet Total																						

	END TREATMENT														QUANTITIES				
	End Sec (Each)		Catch basin, Manhole, Headwall & Junction Structure									Grate		Inlet Depression	Cubic Yard				
Station	C-13.20 & C-13.25	Detail -	Size, (In) Manhole	Standard or Detail	S-Single / D-Double (Ea)	Location	H (0.0) (Ft.)	L Wing (0.0) (Ft.)	L 18" Slotted Drn (0) (Ft.)	L 24" Slotted Drn (0) (Ft.)	Type	Elev. (0.00) (Ft.)	Depth (In.)	L (0.0) (Ft.)	Pipe Exc (0)	Pipe Bkfl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Ltchfld Rd Rp A Sta 14+88 13.5'		D-		C-15.92			6.0		30			994.76	1	2.5					CB502 to Existing Channel
Lt to Sta 14+88 99' Lt																			
																			CB503 to Existing FCDMC
Ltchfld Rd Rp B Sta 14+00 7.5'	1			C-15.92			5.5		30			1008.85	1	2.5					CB504 to Outlet
Rt to Sta 14+00 73.5' Lt																			
Ltchfld Rd Rp B Sta 18+78 11.5'				C-15.91			5.5		30			988.63	1	2.5					CB506 to Pipe 189
Rt to Sta 18+76+54 36.43' Rt																			
Ltchfld Rd Rp C Sta 2+62 26'		D-		C-15.91			5.5		15			987.01	1	2.5					CB508 to CB510
Lt to Sta 2+62 40' Lt																			
Ltchfld Rd Rp C Sta 2+62 40'				C-15.80			3.3					984.70							CB510 to Existing Channel
Lt to Sta 2+62 101.36' Lt																			
Ltchfld Rd Rp C Sta 5+60 25.5'	2			C-15.92			6.5		20			990.64	1	2.5					CB512 to Exst FCDMC
Lt to Sta 5+60 112' Lt																			Regional Retention Basin
Ltchfld Rd Rp D Sta 2+36.15				C-15.91			4.5		25			986.67	1	2.5					CB514 to Pipe 191
16.56' Rt to I-10 EB 6790+52.79																			
143.80' Rt																			
Dysart Rd Rp A Sta 14+34 11' Lt				C-15.91			6.0		20			990.62	1	2.5					CB600 to Exst 48" RCP
to Sta 14+25.04 16.66' Rt																			Storm Drain
Dysart Rd Rp B Sta 18+43 11.84'				C-4.10								989.29	1	2.5					CB602 to Outlet
Sheet Total	2								170										

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90

● SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	$2\frac{2}{3}\times\frac{1}{2}$	D	6x2
B	3x1	E	3x1 or $9\times2\frac{1}{2}$
C	$9\times2\frac{1}{2}$		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

ROUTE: I-10
LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C
010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING
DWG NO C-05.14
____ OF ____

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NOTE:
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NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
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CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
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CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

DESCRIPTION							CSP			CAP		RCP	NRCP	NRCIPCP	CHDPEPP	END TREATMENT														QUANTITIES	
			In.	In.	Ft.	Degree	In.	Coating		In.			In.			Each	Ea	Catch basin, Manhole, Headwall & Junction Structure												Cubic Yard	
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class	Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25	Detail -	Size, (in) Manhole	Standard or Detail	End Sec	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Inlet Depression Grate Ft. In. / Ft. Depth	Inlet Depression Grate Ft. In. / Ft. L (0.0)	Pipe Exc (0)	Pipe Bk-fl (0)	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Dysrat Rd Rp C Sta 6+87 22.31' Lt to Sta 6+87 37.81' Lt	604			24	12																		1		C-15.91				4.0		20			995.12	1	2.5					CB604 to Outlet
Dysart Rd Rp D Sta 3+02 12.18' Rt to Sta 3+02 26.38' Rt	606			24	10																		1		C-15.91				4.0		30			992.67	1	2.5					CB606 to Drainage Ditch
I-10 WB Sta 6686+00 250.52' Lt to Sta 6688+86.48 232.21' Lt	700			24	288																		1																		Pipe 700 to MH702
I-10 WB Sta 6688+86.48 232.21' Lt to Sta 6692+000 193.33' Lt	702			24	315																				C-18.10				6.7					1001.80							MH704 to MH704
I-10 WB Sta 6692+00 193.33' Lt to Sta 6695+29.64 161.64' Lt	704			24	331																				C-18.10				4..31					997.80							MH704 to MH706
I-10 WB Sta 6695+29.64 161.64' Lt to Sta 6697+50 161.89' Lt	706			24	170																		1		C-18.10				6.0					997.80							MH706 to Drainage Ditch 'B'
Sheet Total																							1							50										

FILL HEIGHT RANGE TABLE (Ft.)												
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

DWG NO S-05.15

___ OF ___

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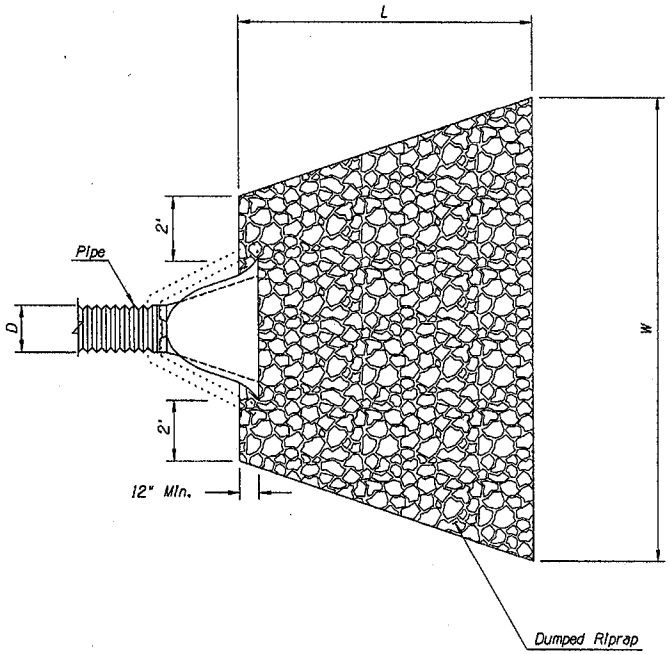
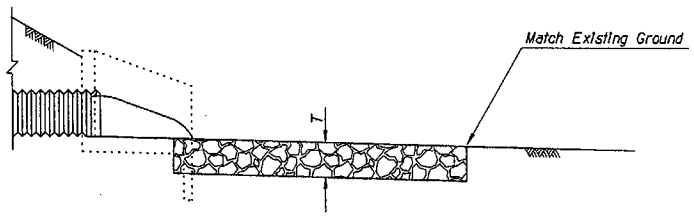
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)	209		
		010 MA 126			





RIPRAP APRON LOCATION

Pipe Station or Location	D (IN)	L (FT)	W (FT)	T (IN)	D_{50}=6" 9130051 (CY)	D_{50}=9" 9130052 (CY)	Remarks

NOTES

The geometric shape of the apron may vary to match the existing site conditions as directed by the Engineer.

DETAIL D1

RIPRAP APRON

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DETAIL SHEET
DETAIL D

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-01.01
TRACS NO. H7296 01C	010-B(202)	OF

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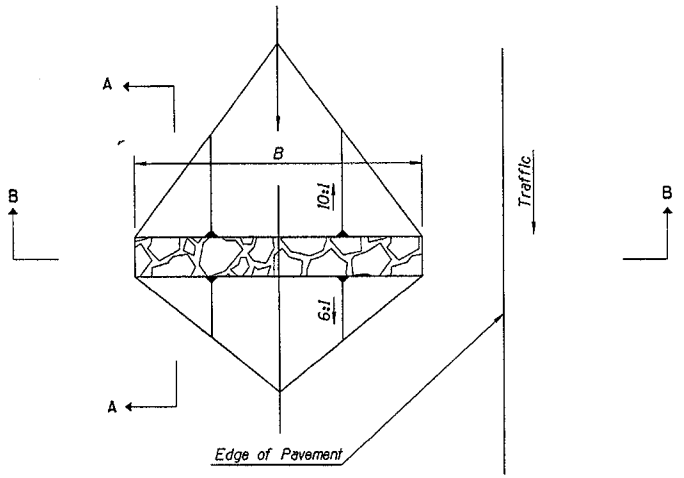
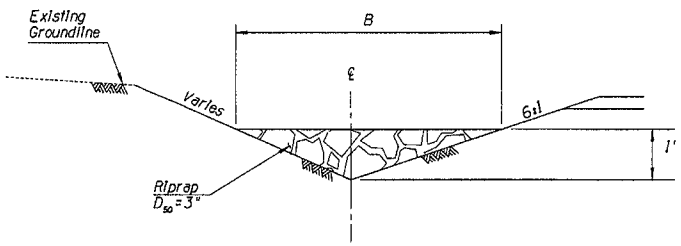
9	ARIZ.	010-B(202)	48		
		010 MA 126			

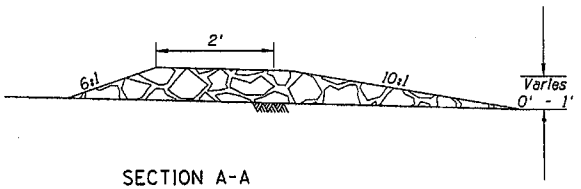


PLAN VIEW



Section B-B

CHECK DAM LOCATIONS					
Location	Location	B (ft)	Number (EA)	Spacing (ft)	Riprap D_{50}=3" 9130036 (CY)
SB 1709+50	SB 1711+00	12	2	115	1
SB 1713+50	SB 1714+25	12	3	48	2
SB 1716+75	SB 1720+00	12	7	55	4
SB 1721+00	SB 1727+50	7	18	38	5
SB 1786+00	SB 1792+00	12	3	231	2
SB 1792+00	SB 1809+00	7	13	108	4



SECTION A-A

DETAIL D2

CHECK DAM

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

CHECK DAM DETAIL

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-01.02

TRACS NO.			SHEET NO.
H7296 01C		010-B(202)	___ OF ___

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)	210		

010 MA 126

PIPE SLEEVE FILLING SCHEDULE

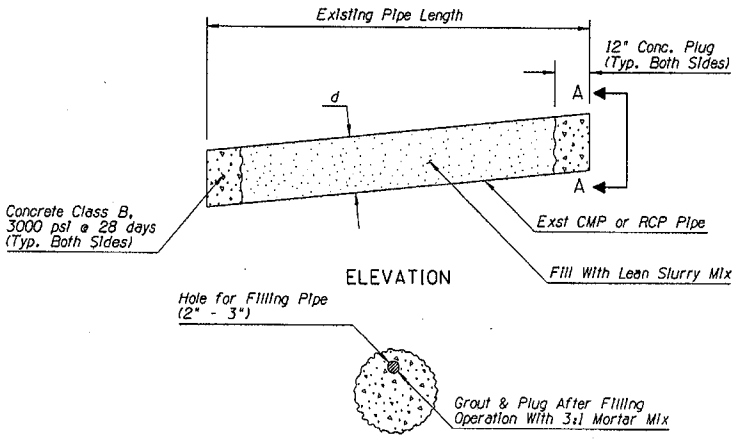
Station	d (Inches)	Pipe Length (feet)	Pipe Type

Refer to Utilities & Plan Removal Sheets.

PIPE FILLING SCHEDULE

Station	d (Inches)	Pipe Length (feet)	Pipe Type

Refer to Utilities and Plan Removal Sheets



DETAIL D3

PIPE PLUGGING DETAIL

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DETAIL SHEET
DETAIL D

PRELIMINARY
Stage III Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-01.03

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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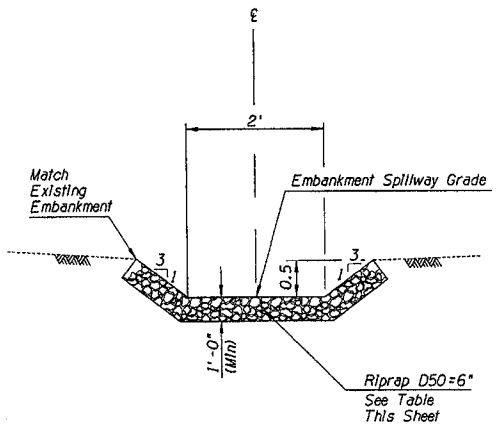
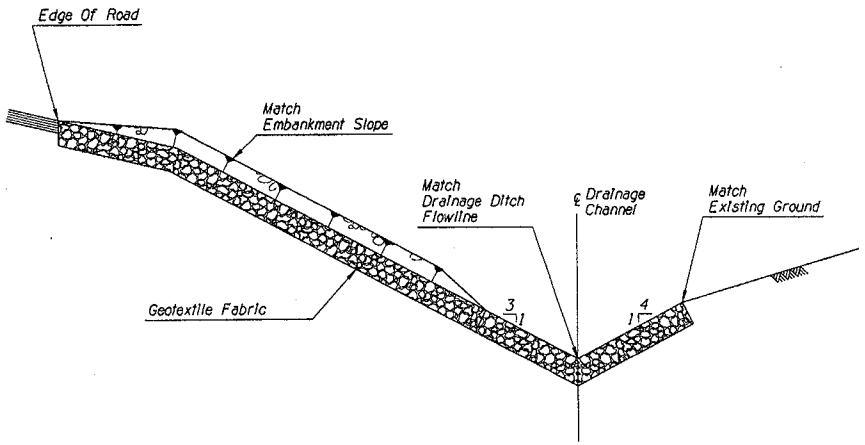
F.A.H.U. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)	208		

010 MA 126

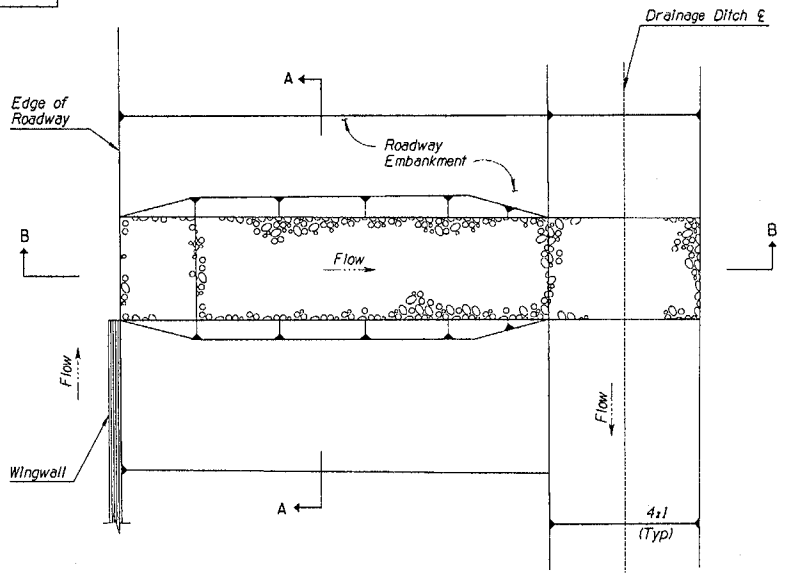
Dumped Riprap Gradation	
D_{50}= 6"	
Size of Rocks	% Passing
12"	90-100
9"	70-85
6"	30-50
4"	5-15
2"	0-5



SECTION A-A
TYPICAL SECTION



SECTION B-B
RIPRAP EMBANKMENT SPILLWAY PROFILE



DETAIL D4

RIPRAP EMBANKMENT SPILLWAY

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DETAIL SHEET
DETAIL D

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-01.04

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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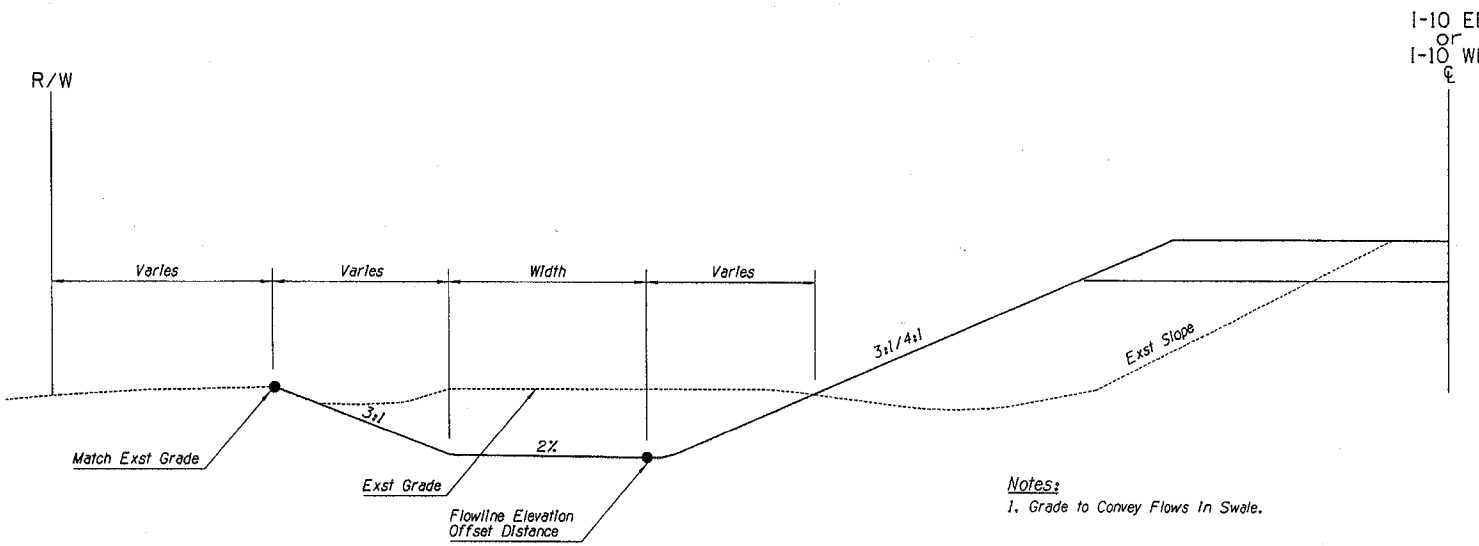
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)	210		
		010 MA 126			



Notes:
1. Grade to Convey Flows In Swale.

DRAINAGE DITCH 'A'

GEOMETRICS			
STATION	I-10 EB OFFSET	WIDTH	FLOWLINE ELEVATION
.	.	.	.

DRAINAGE DITCH 'B'

GEOMETRICS			
STATION	I-10 WB OFFSET	WIDTH	FLOWLINE ELEVATION
.	.	.	.

DRAINAGE DITCH 'C'

GEOMETRICS			
STATION	OFFSET	WIDTH	FLOWLINE ELEVATION
.	.	.	.

DRAINAGE DITCH 'D'

GEOMETRICS			
STATION	OFFSET	WIDTH	FLOWLINE ELEVATION
.	.	.	.

DRAINAGE DITCH 'E'

GEOMETRICS			
STATION	OFFSET	WIDTH	FLOWLINE ELEVATION
.	.	.	.

DETAIL D5

DRAINAGE DITCH/ CUT DITCH

	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	W WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DETAIL SHEET
DETAIL

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-01.05

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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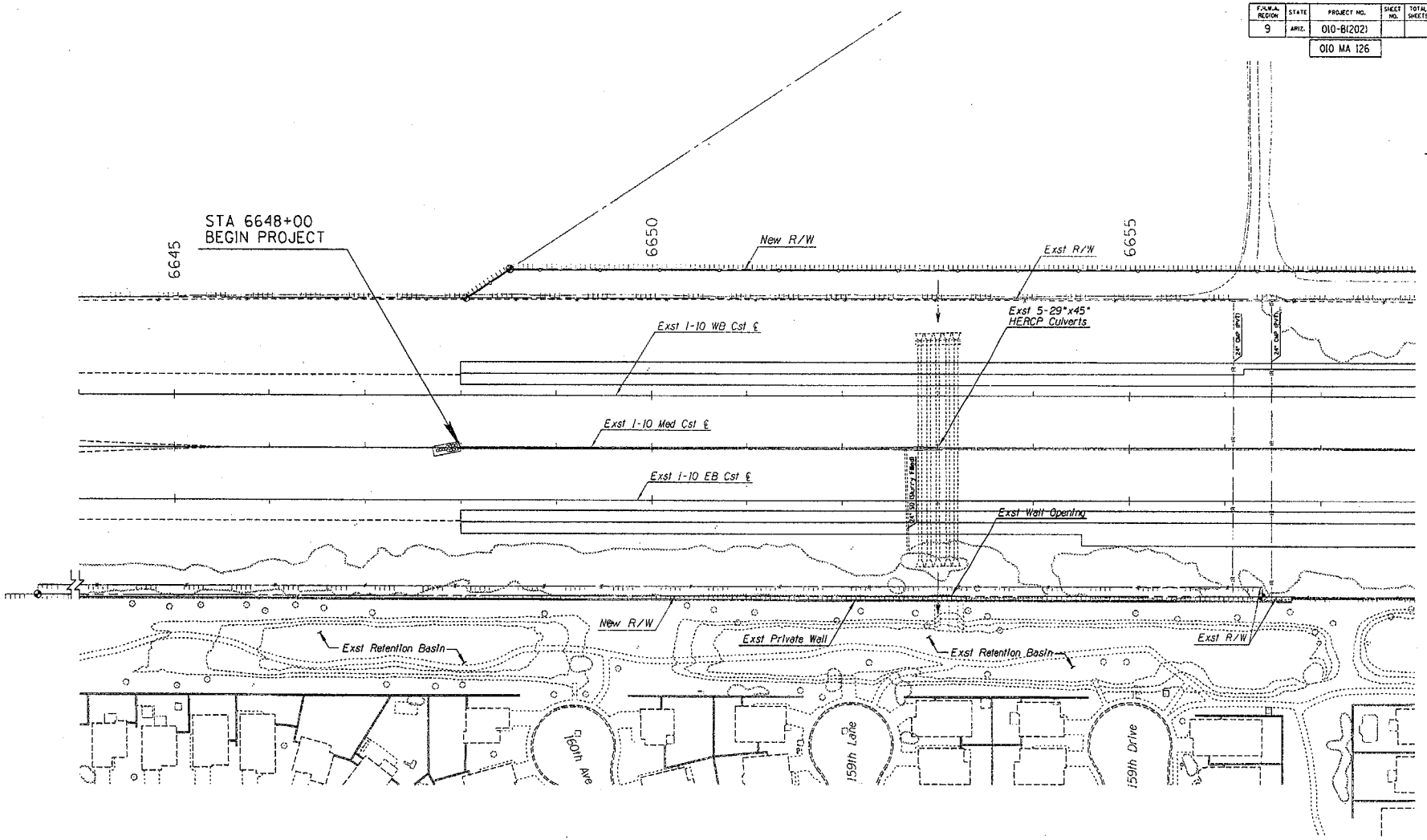
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126



	NAME	DATE
DESIGN	O JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6648+00 to 6658+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.01

___ OF ___

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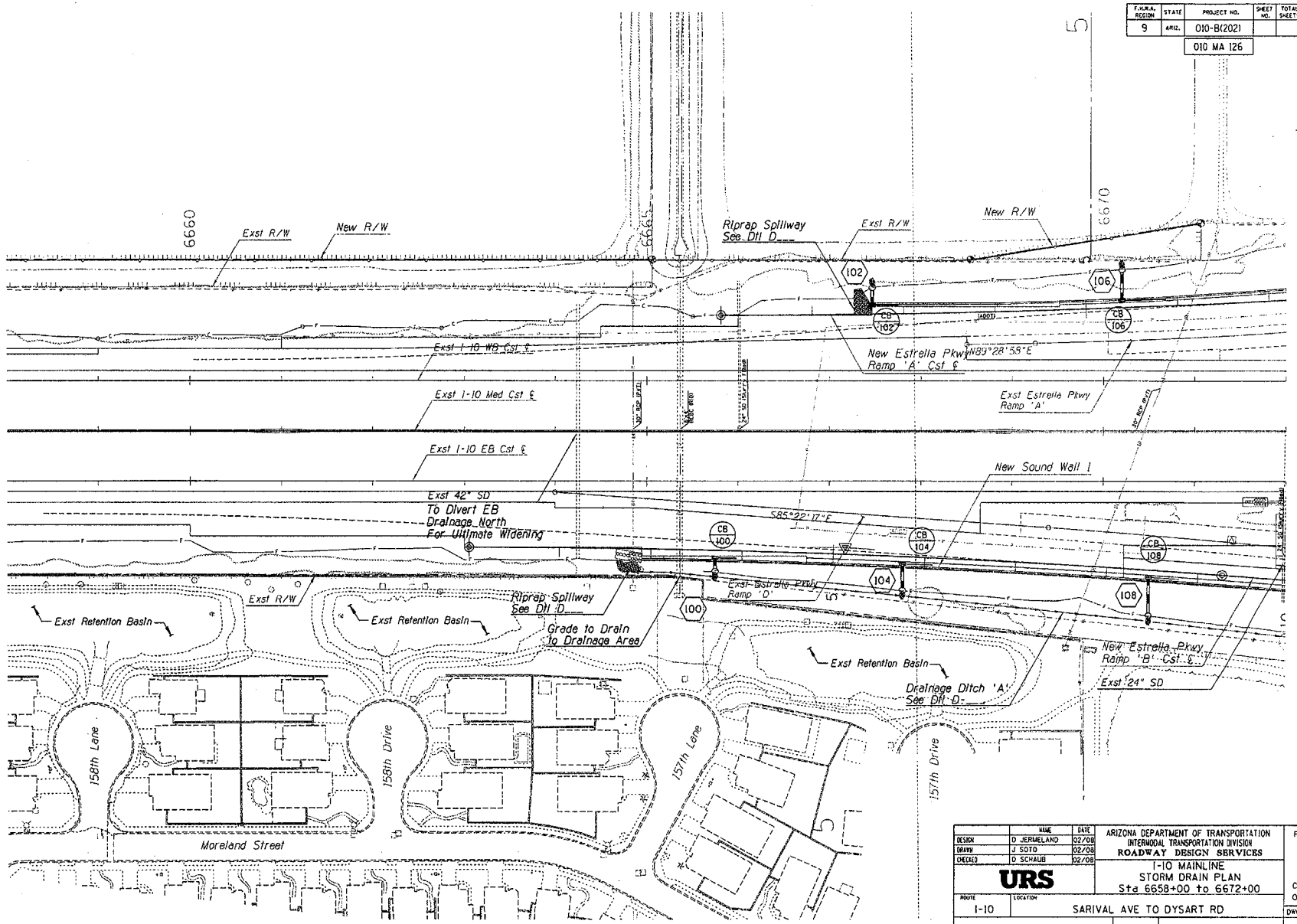

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHALIB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6658+00 to 6672+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.02

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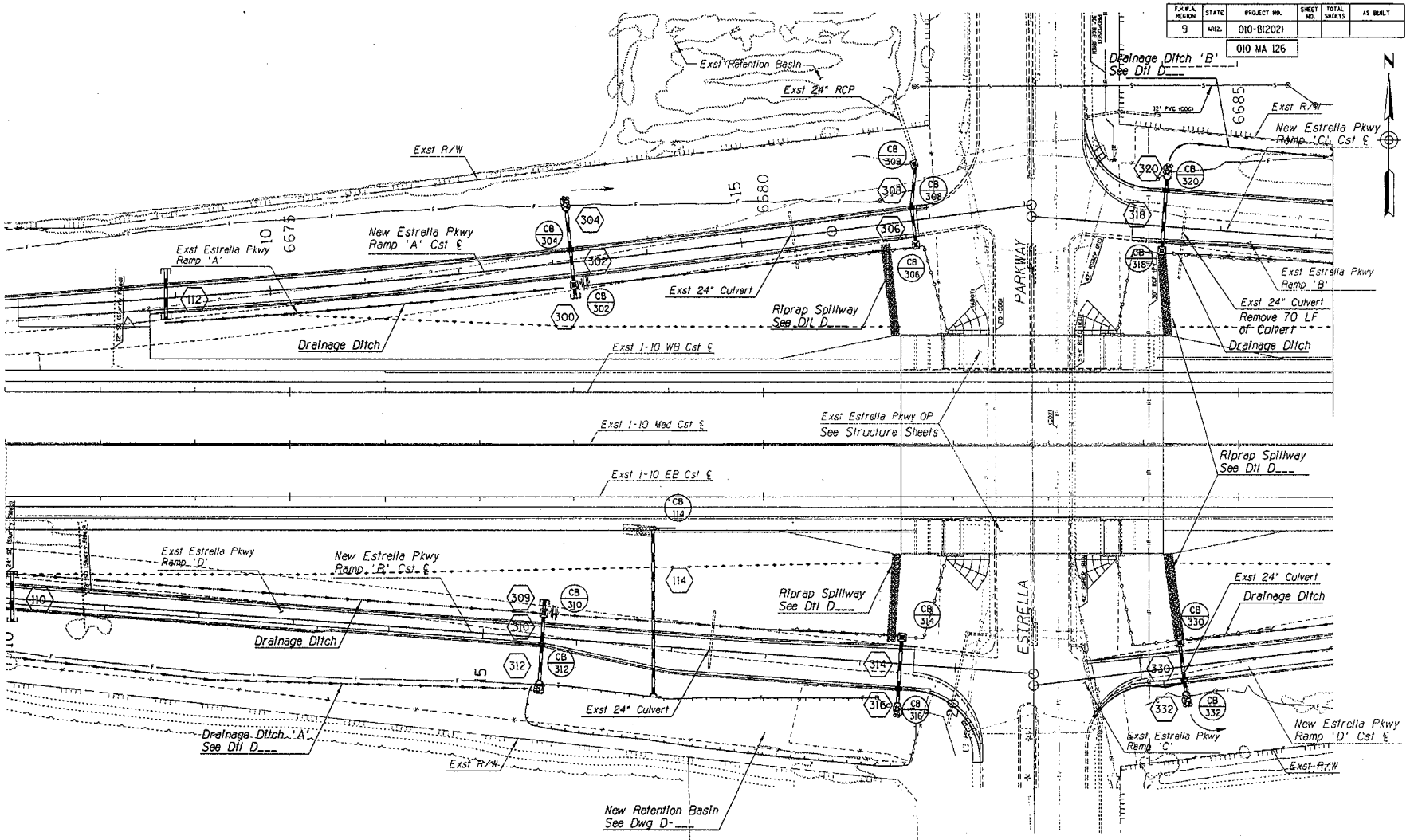

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERWELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6672+00 to 6686+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.03

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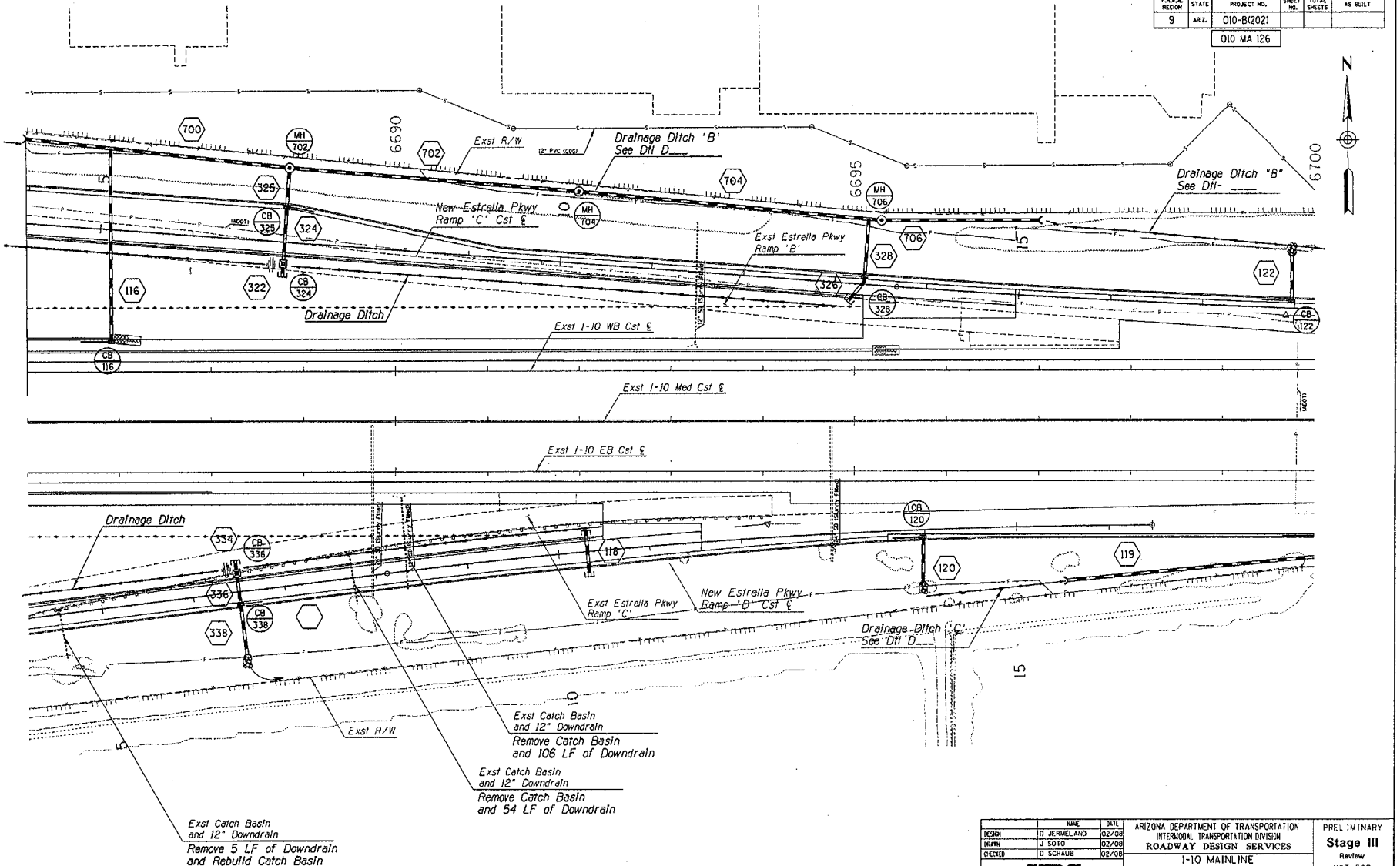

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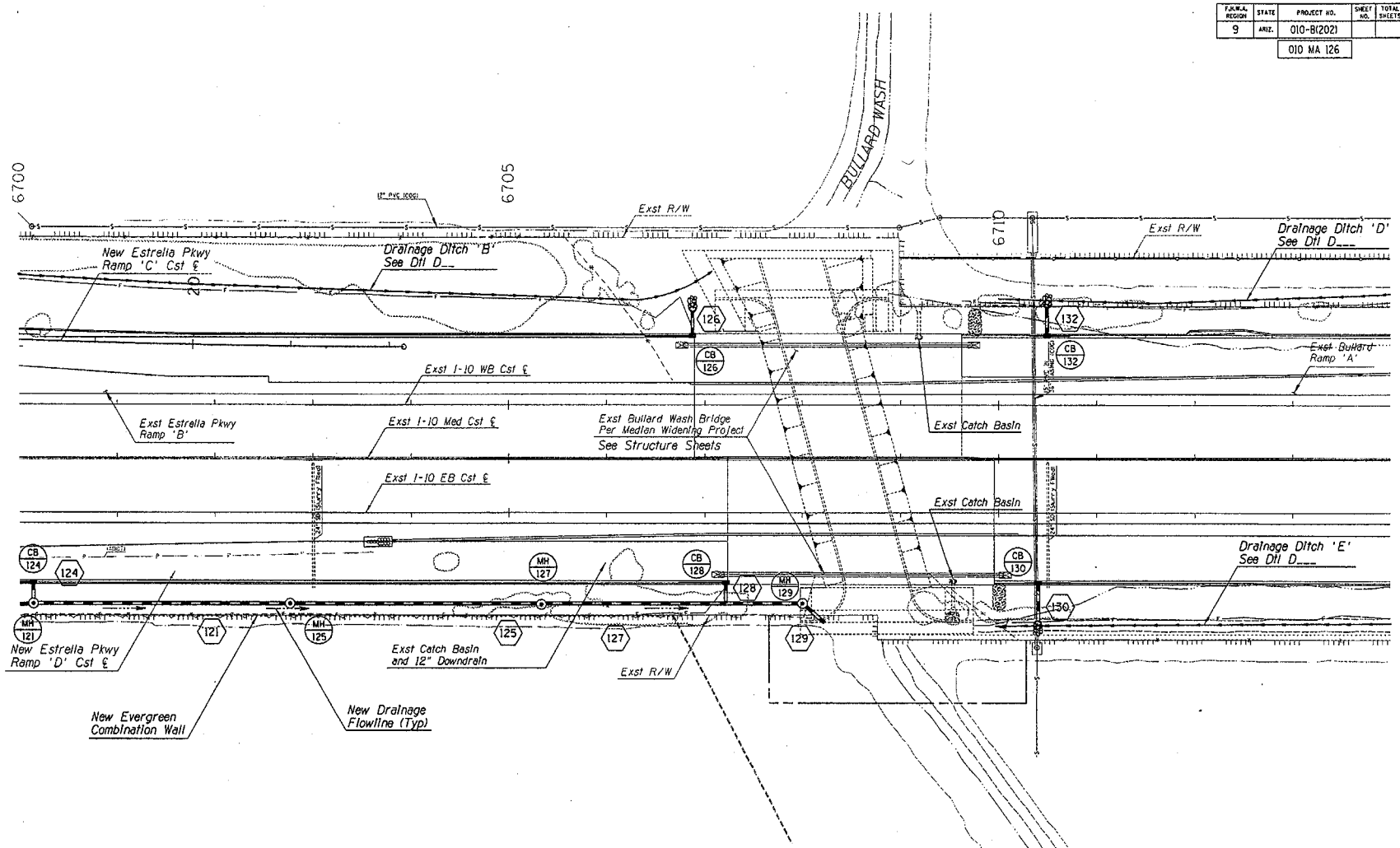
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6700+00 to 6714+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.05

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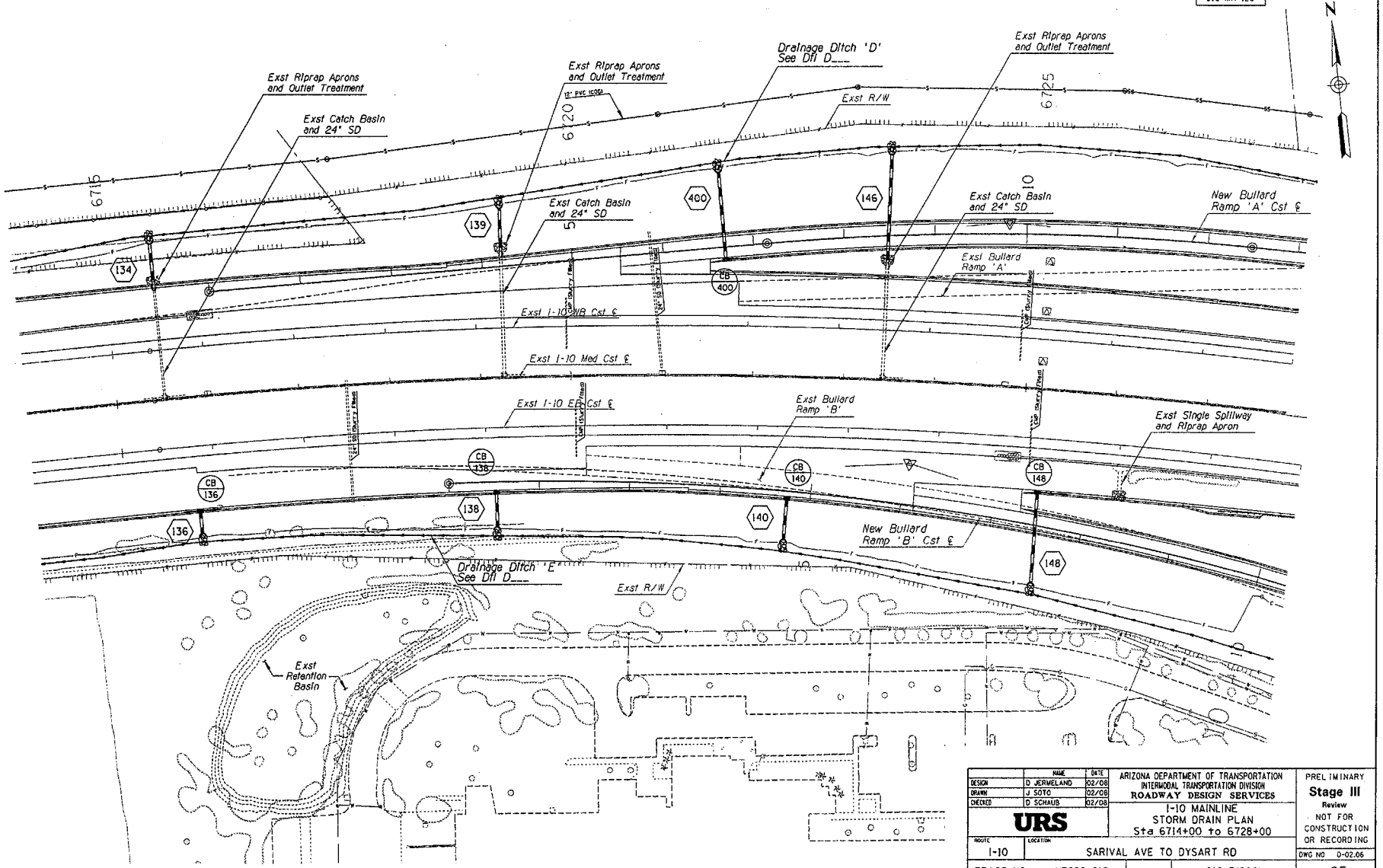
F.A.H.N. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6714+00 to 6728+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 0-02.06

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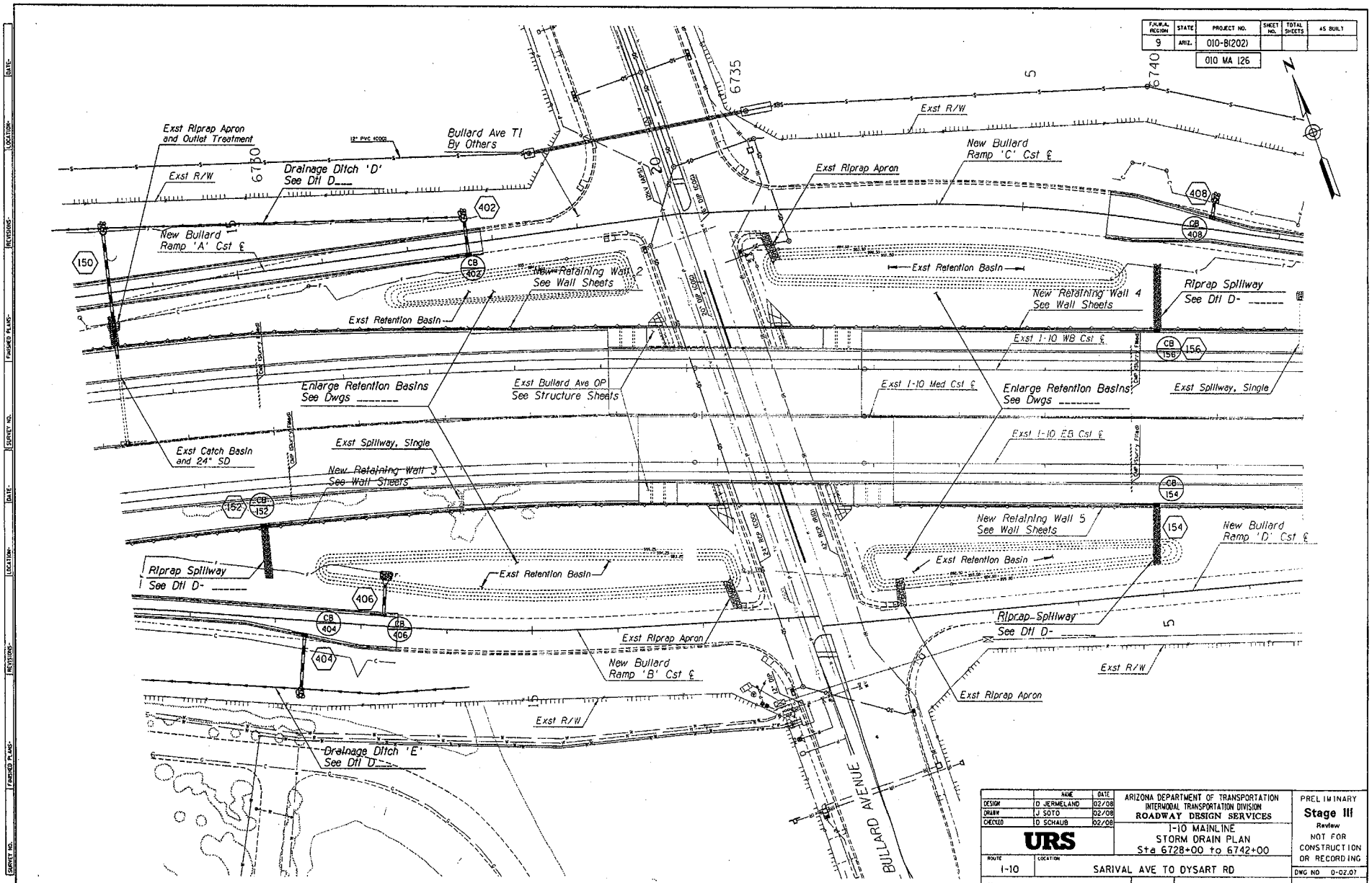

F.A.H.U.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6728+00 to 6742+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.07

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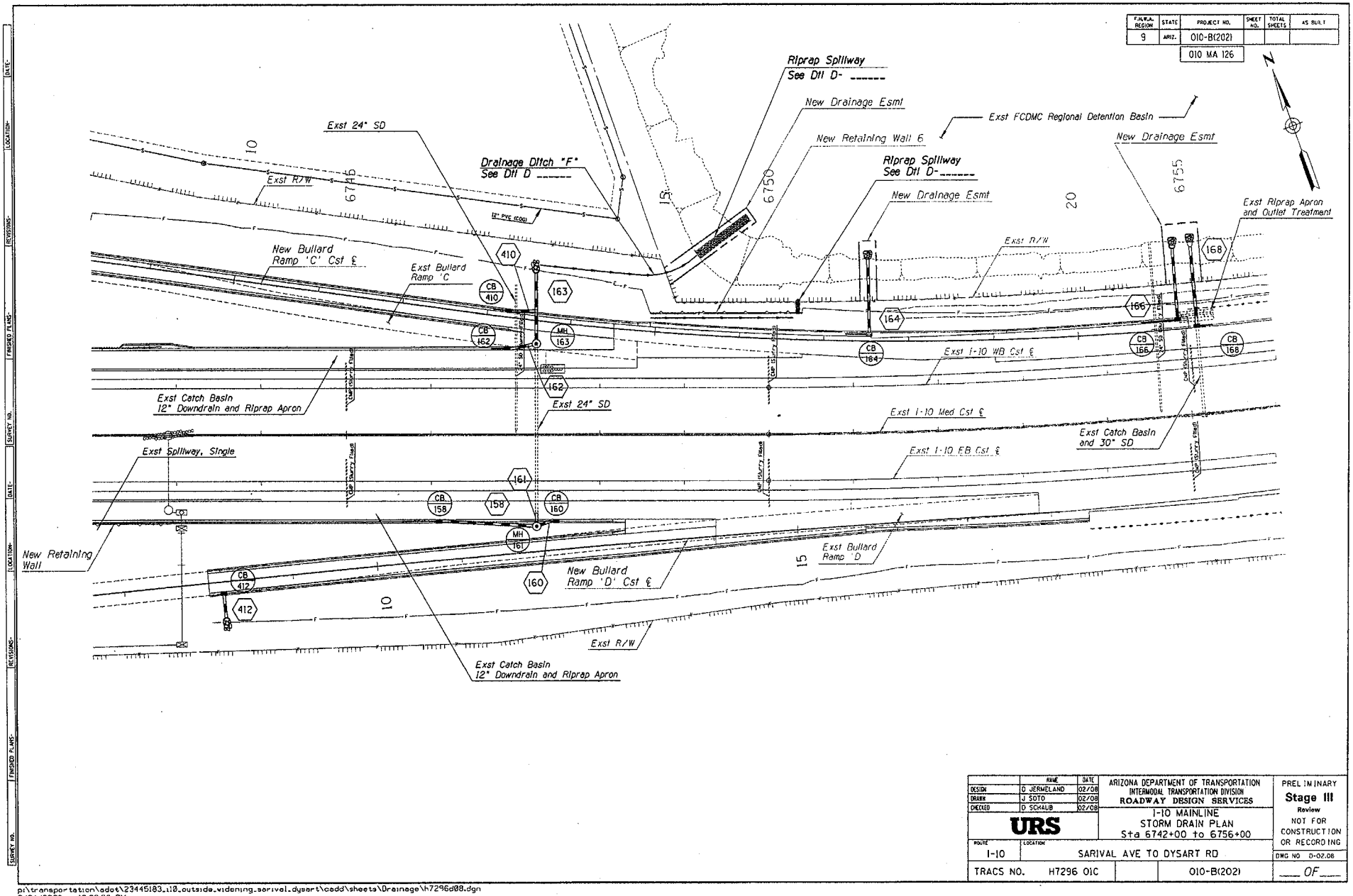

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6742+00 to 6756+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.08

___ OF ___

SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE | SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE

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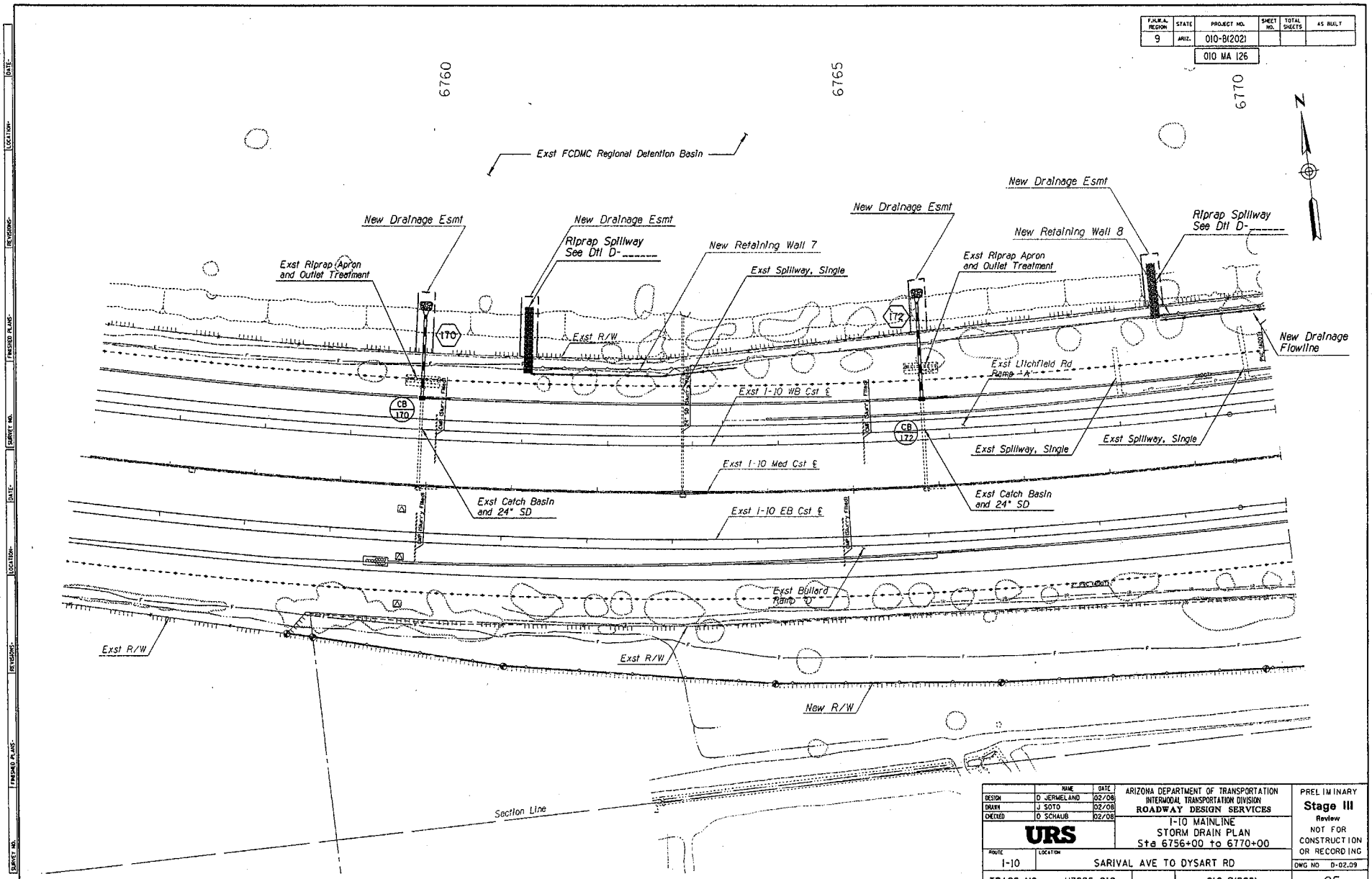
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	O SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6756+00 to 6770+00

ROUTE: I-10 | LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.09

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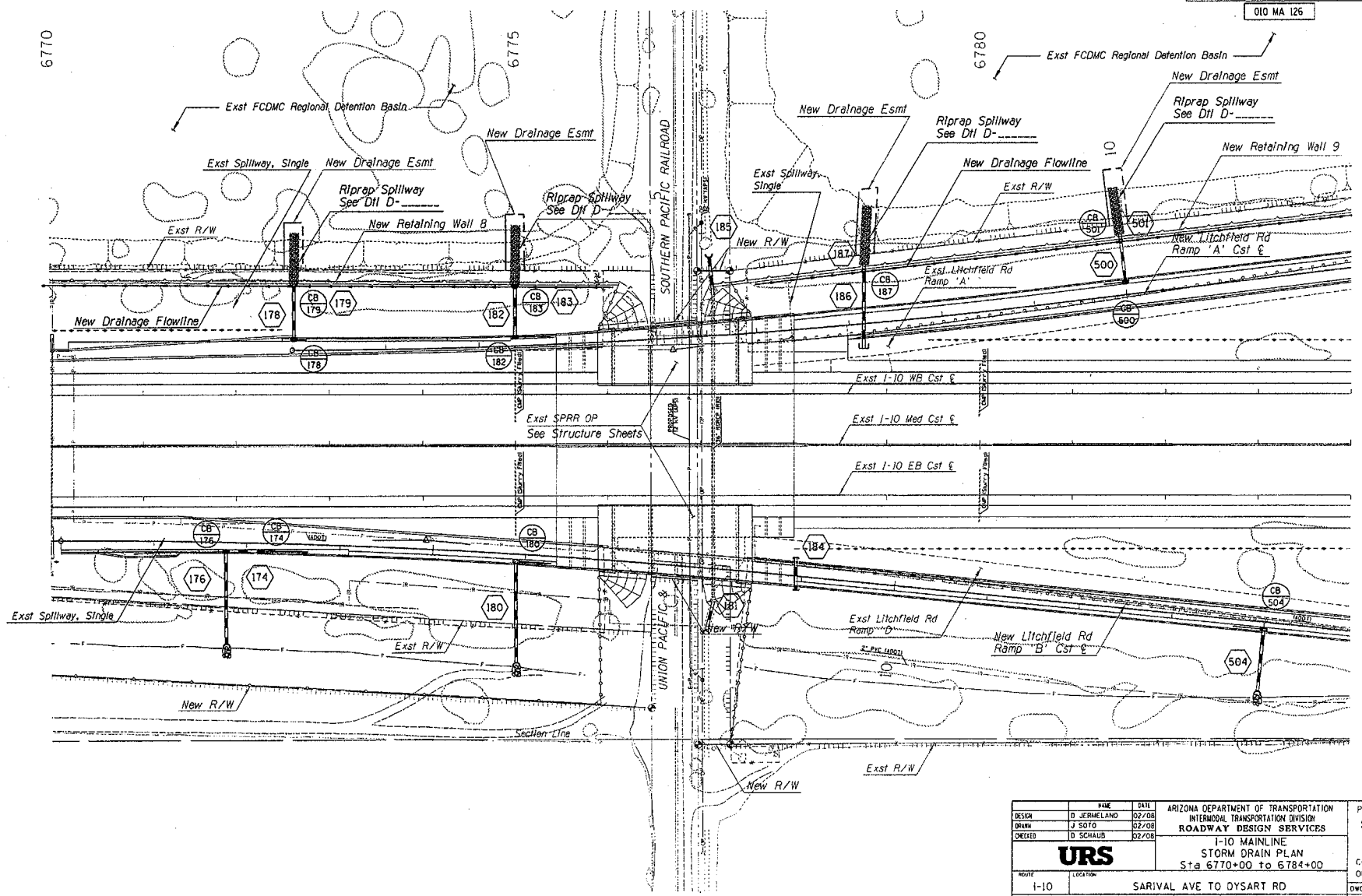

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6770+00 to 6784+00

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO.	H7296 01C	010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.10

OF

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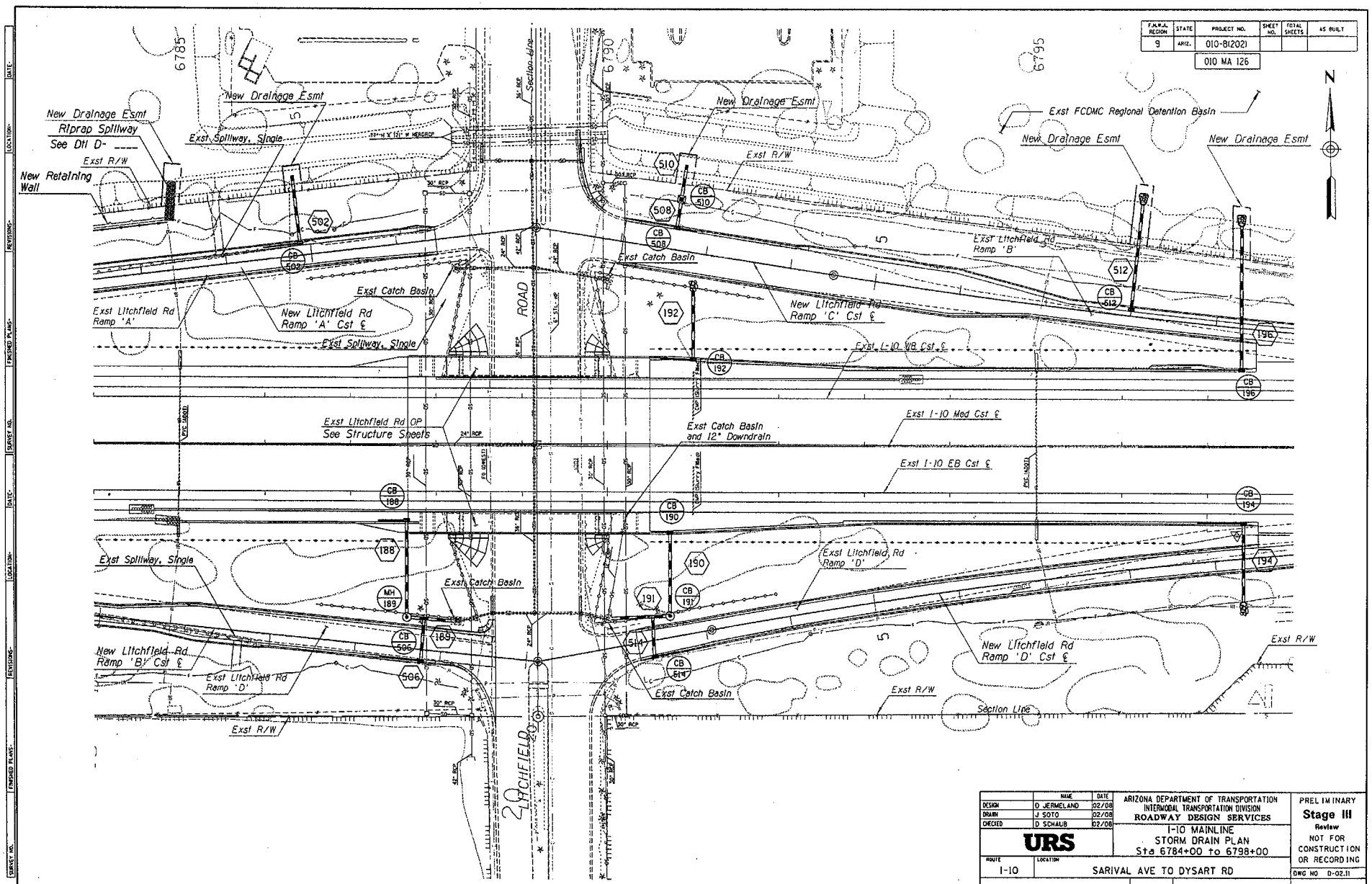

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6784+00 to 6798+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.11

___ OF ___

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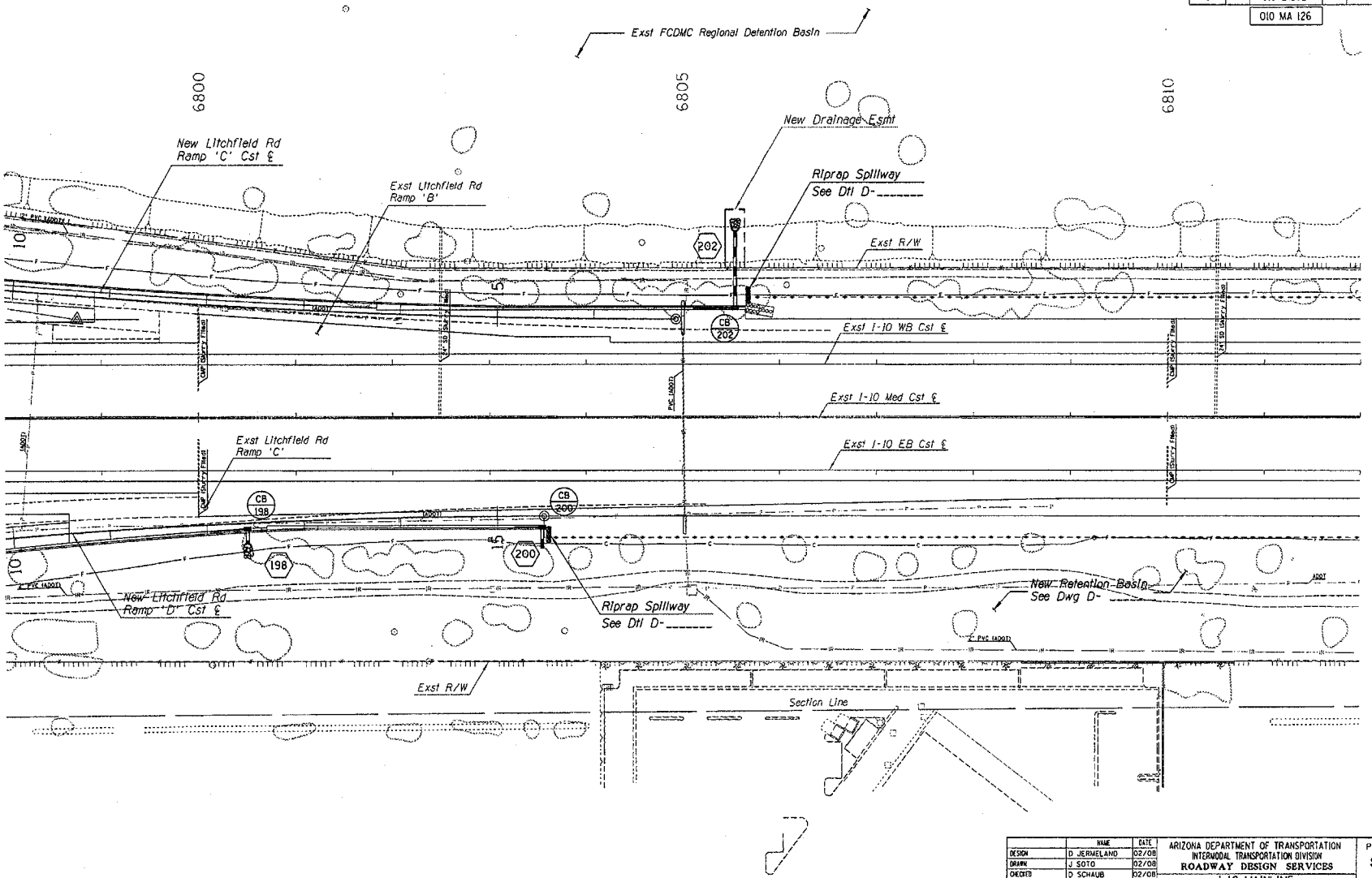
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6798+00 to 6812+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO.	H7296 01C		010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.12

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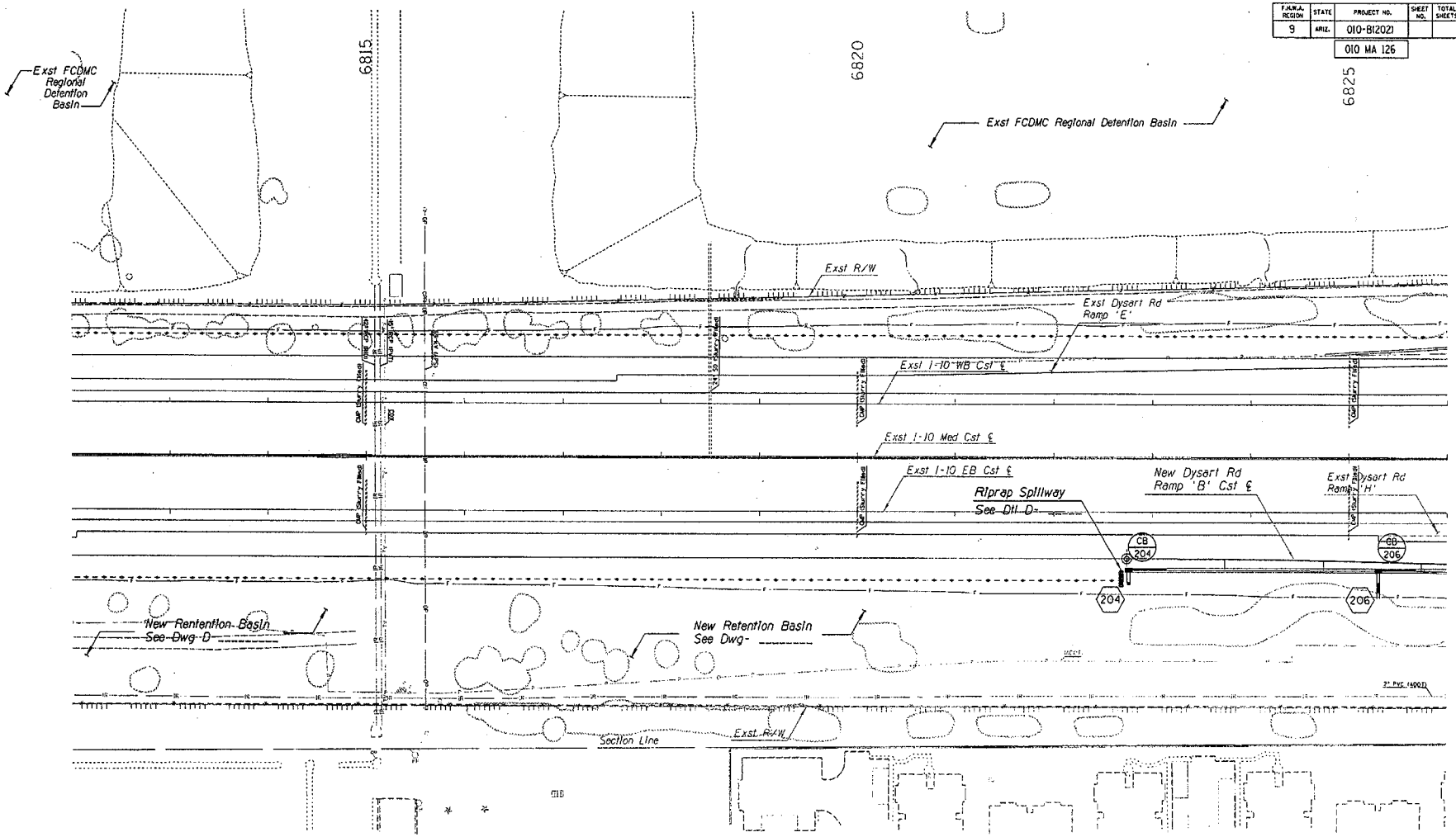

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6812+00 to 6826+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.13

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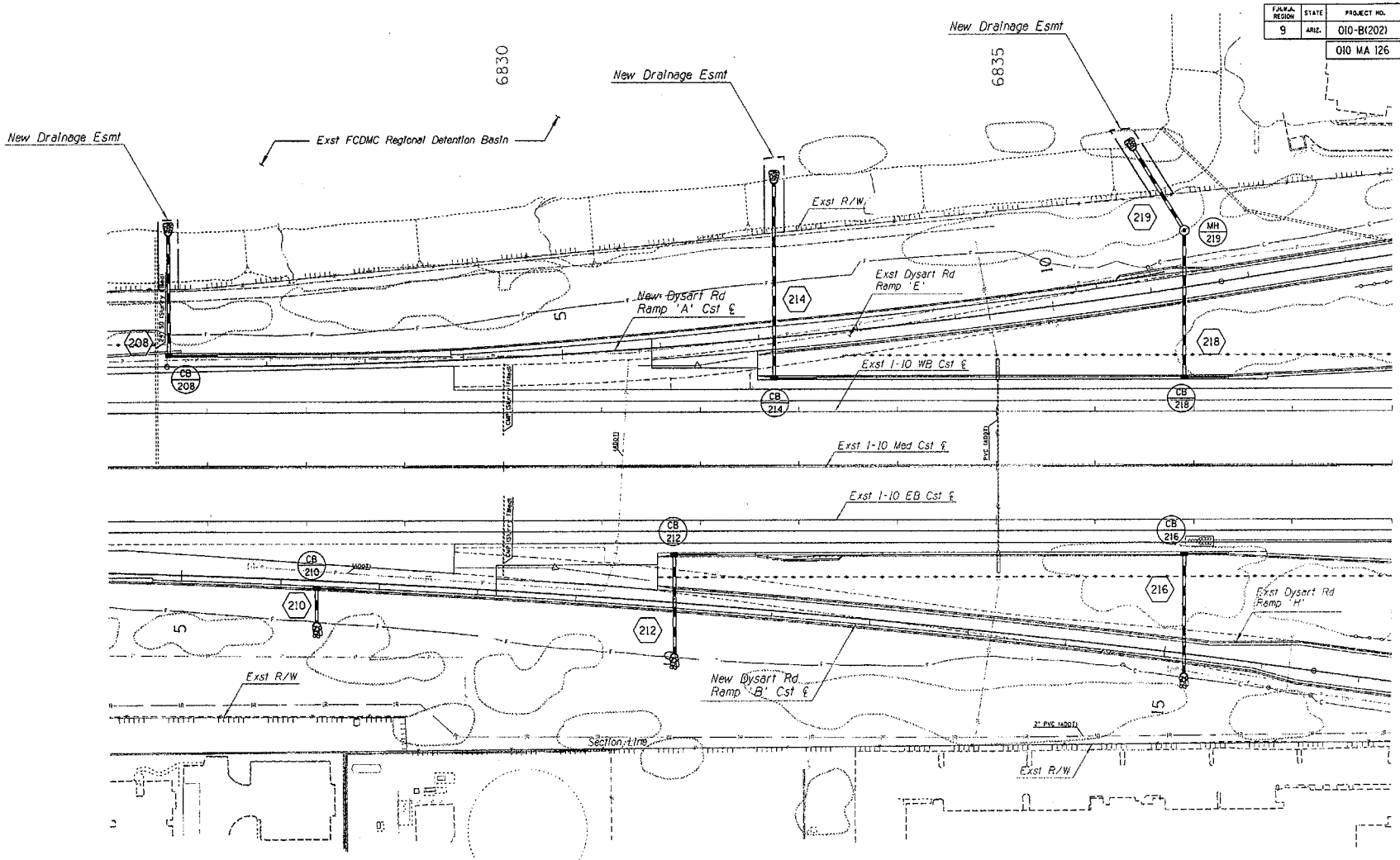

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6826+00 to 6839+00

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		
TRACS NO.	H7296 01C		010-B(202)

DWG NO D-02.14

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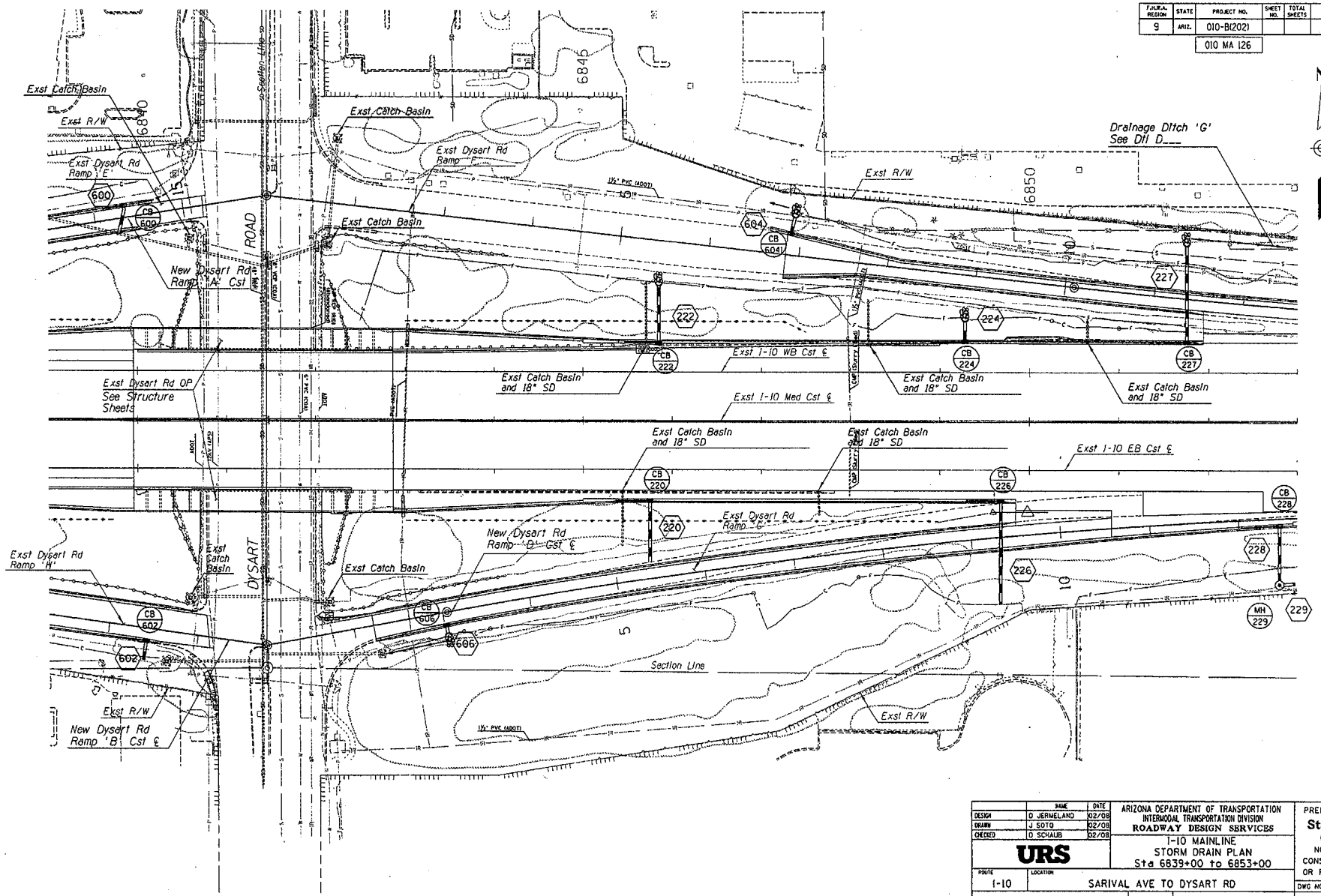

F.A.H.P.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	J. SOTO	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6839+00 to 6853+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.15

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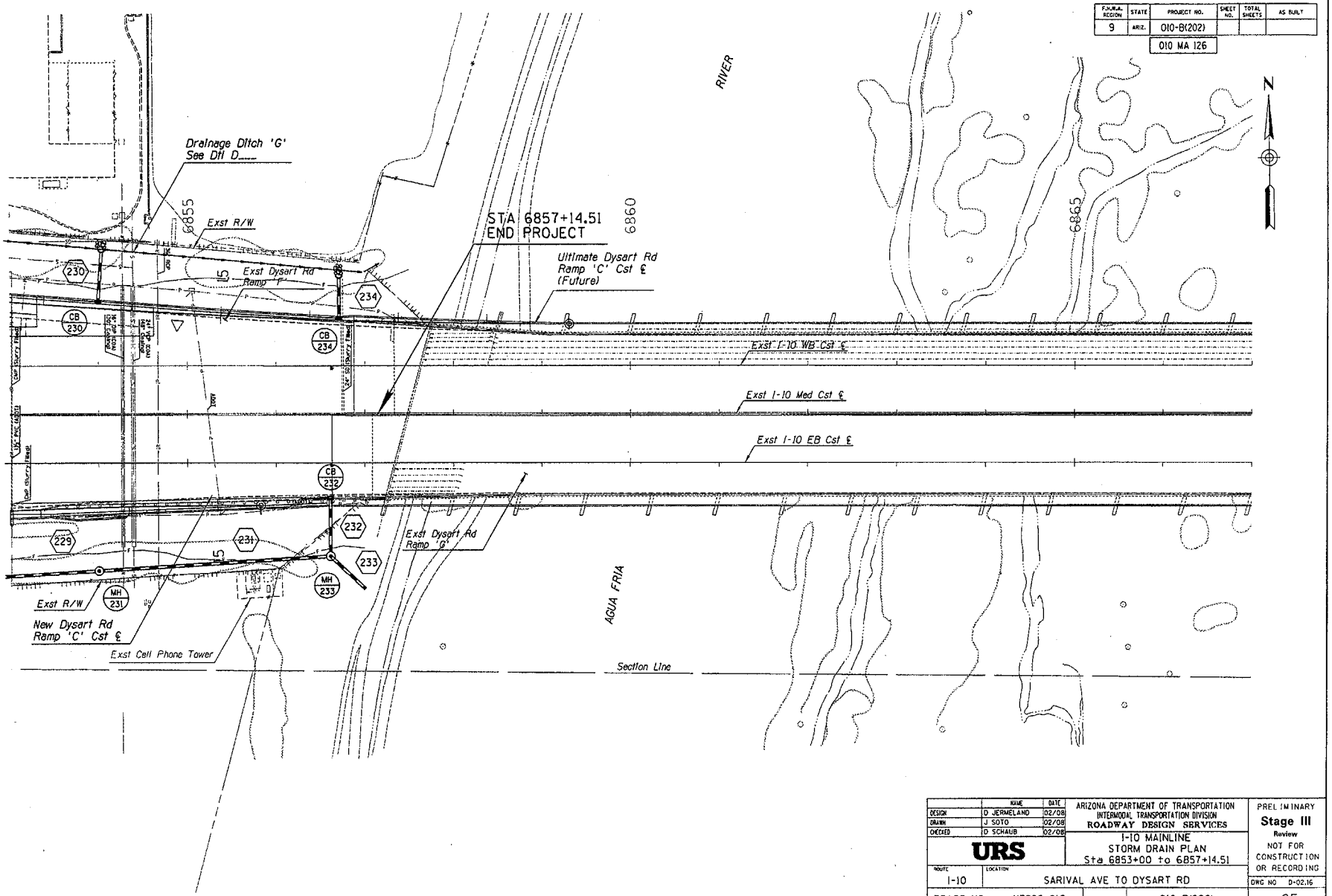

F.A.H.R.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	J SOTO	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
STORM DRAIN PLAN
Sta 6853+00 to 6857+14.51

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.16

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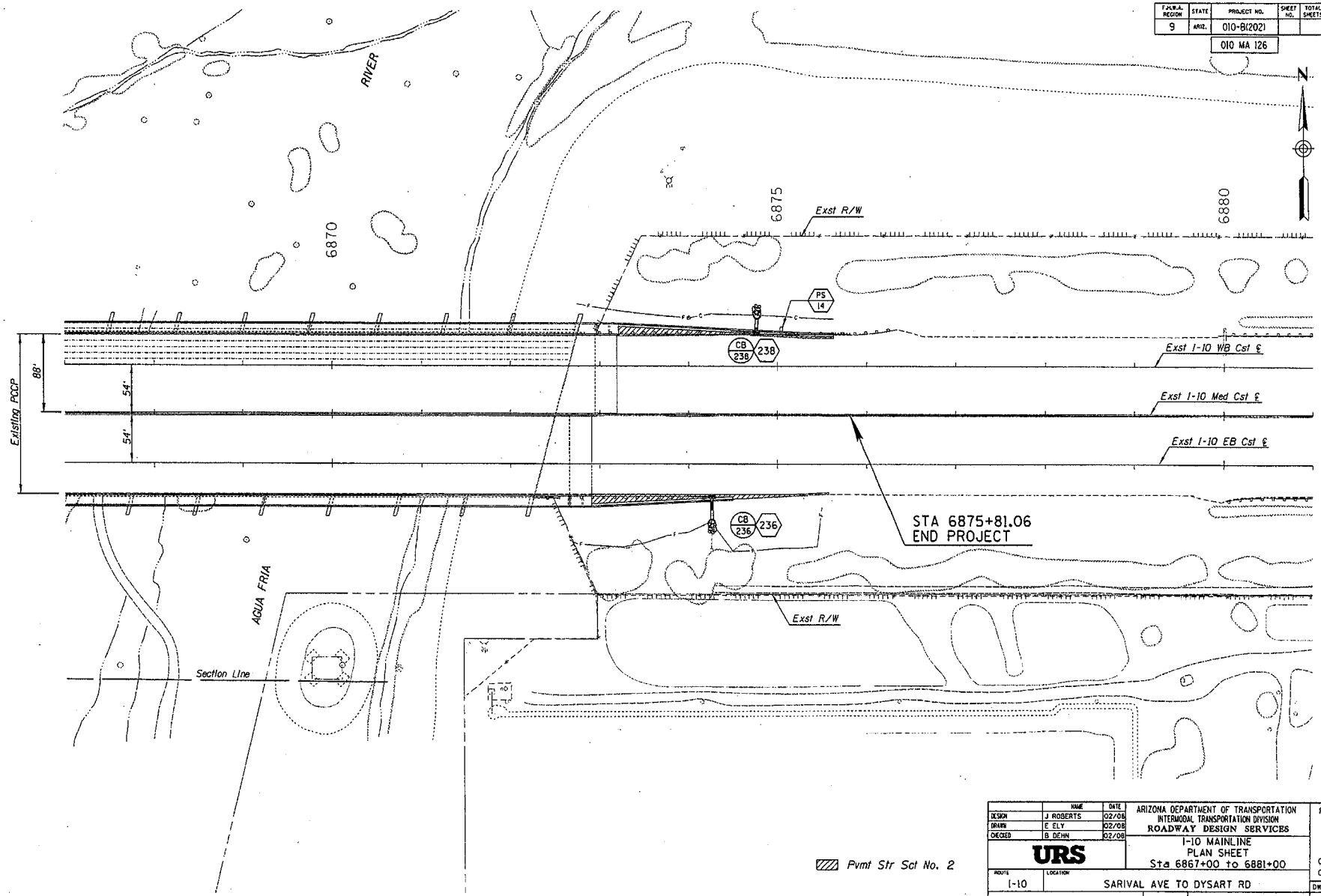

FAI/W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	J ROBERTS	02/08
DRAWN	E ELY	02/08
CHECKED	B DEHN	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
PLAN SHEET
Sta 6867+00 to 6881+00

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202) | DWG NO C-02.17 | ___ OF ___

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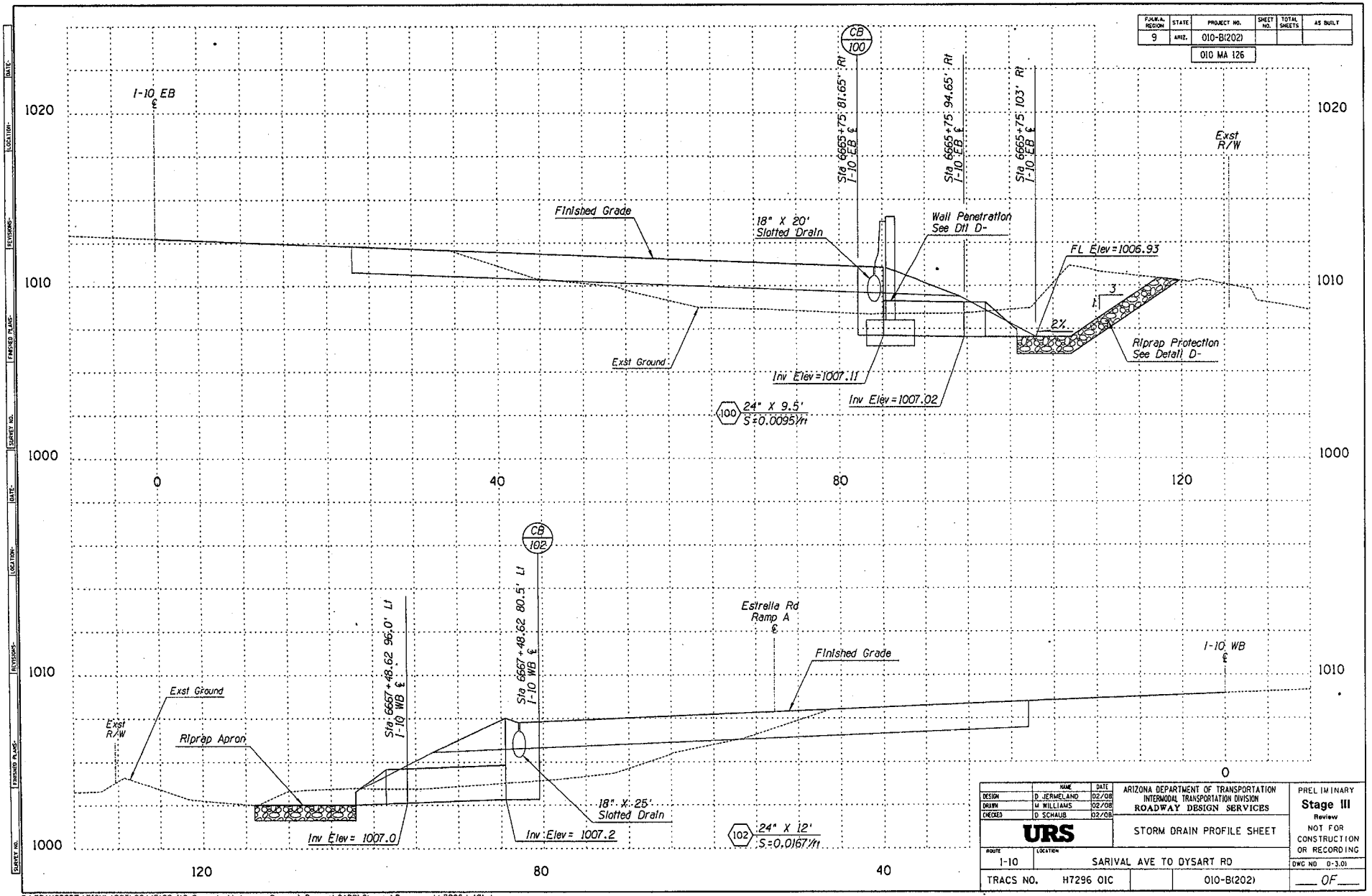

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: I-10 | LOCATION: SARIVAL AVE TO DYSART RD

DWG NO D-3.01

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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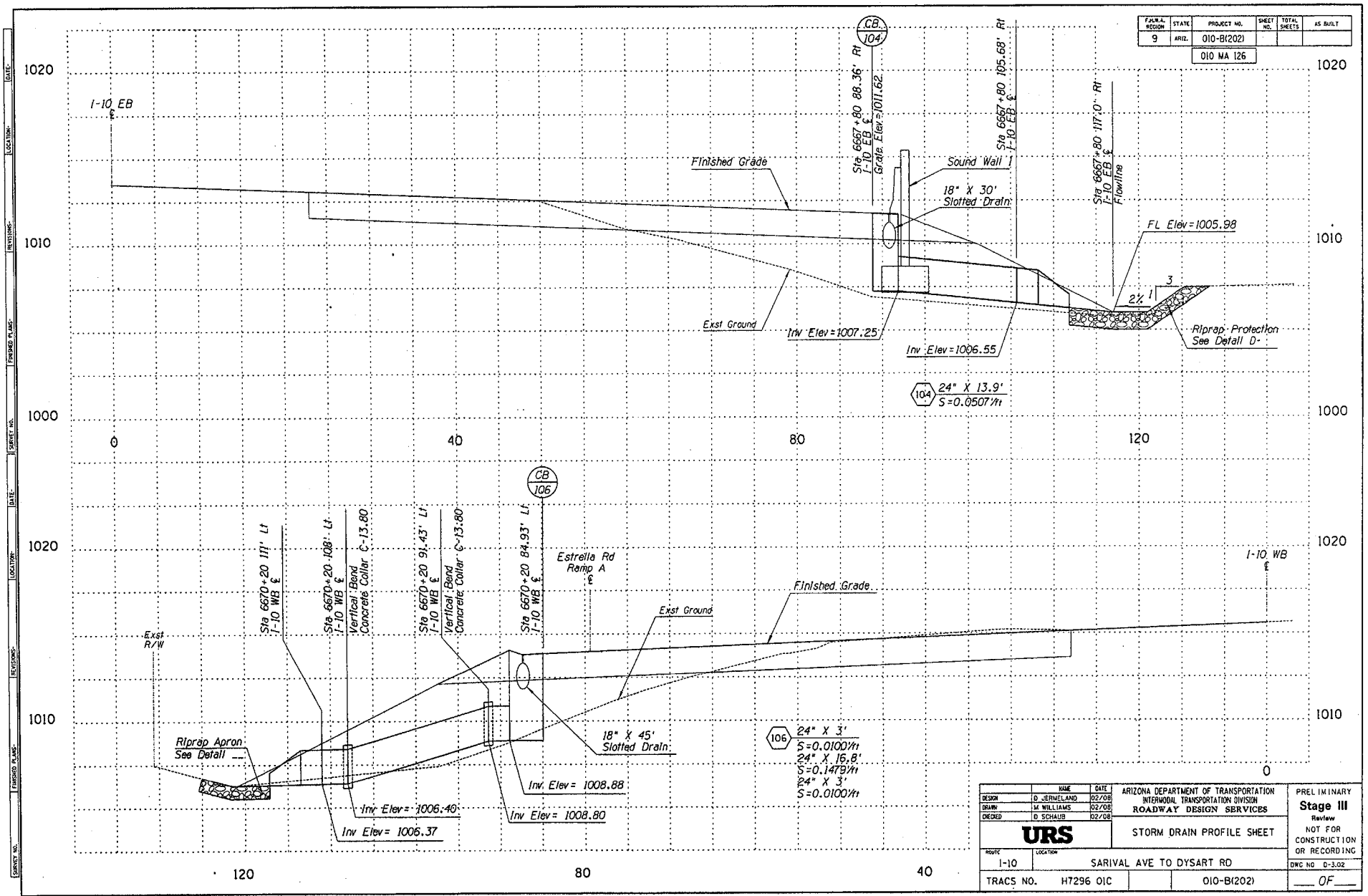

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		DWG NO D-3.02
TRACS NO. H7296 01C		010-B(202)	___ OF ___

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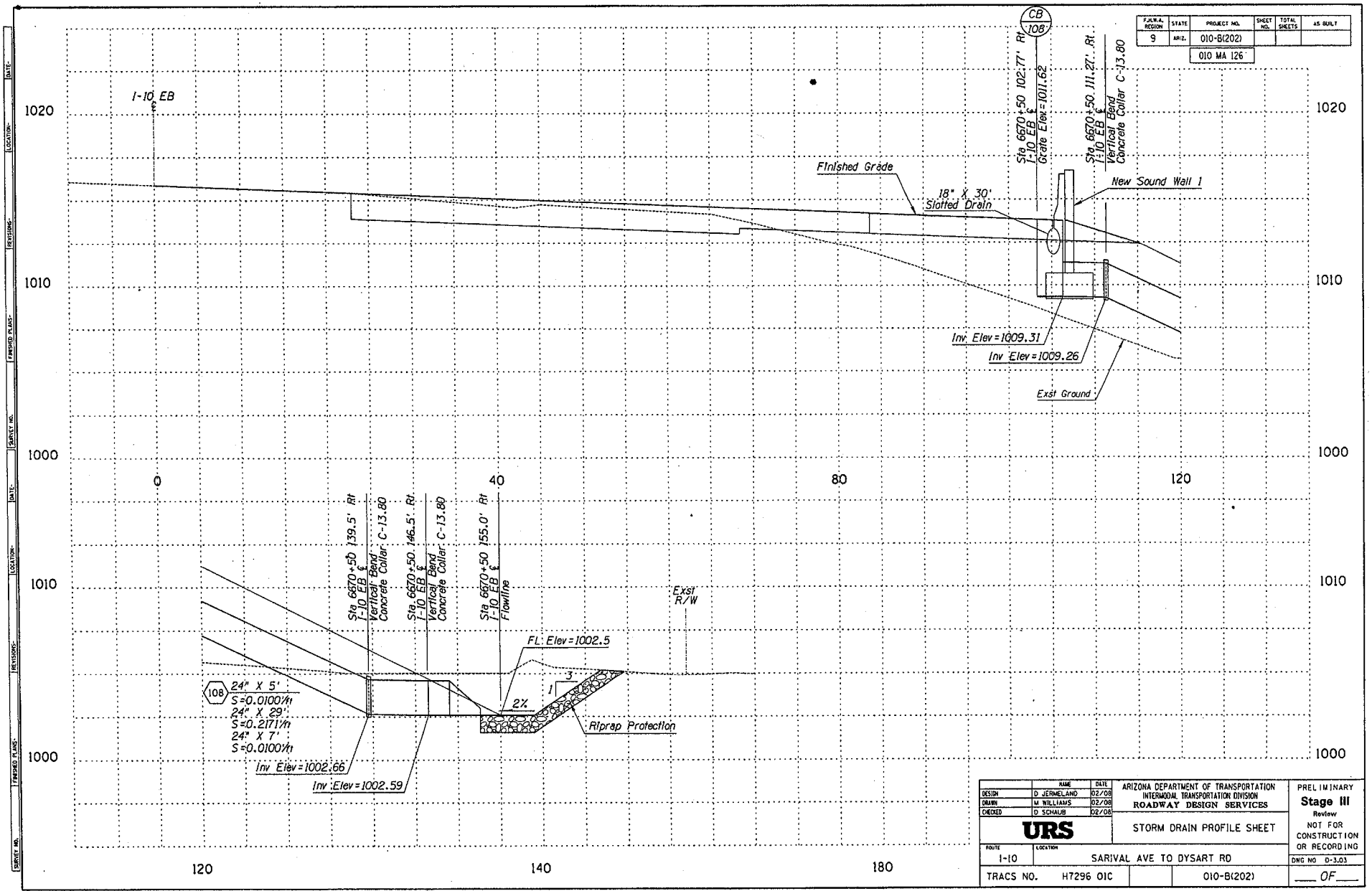

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.03

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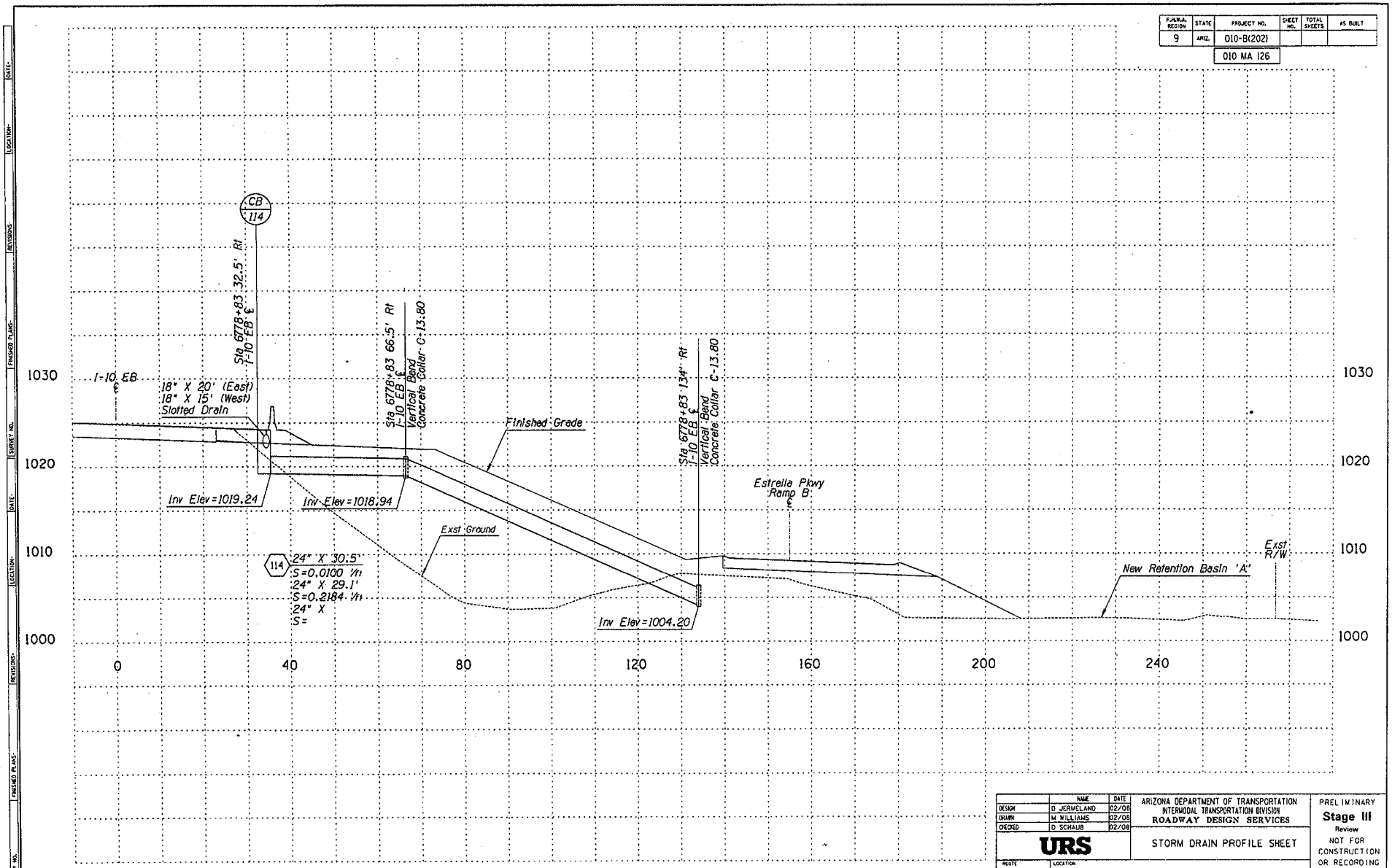
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		
TRACS NO.	H7296 01C		010-B(202)

DWG NO D-3.04

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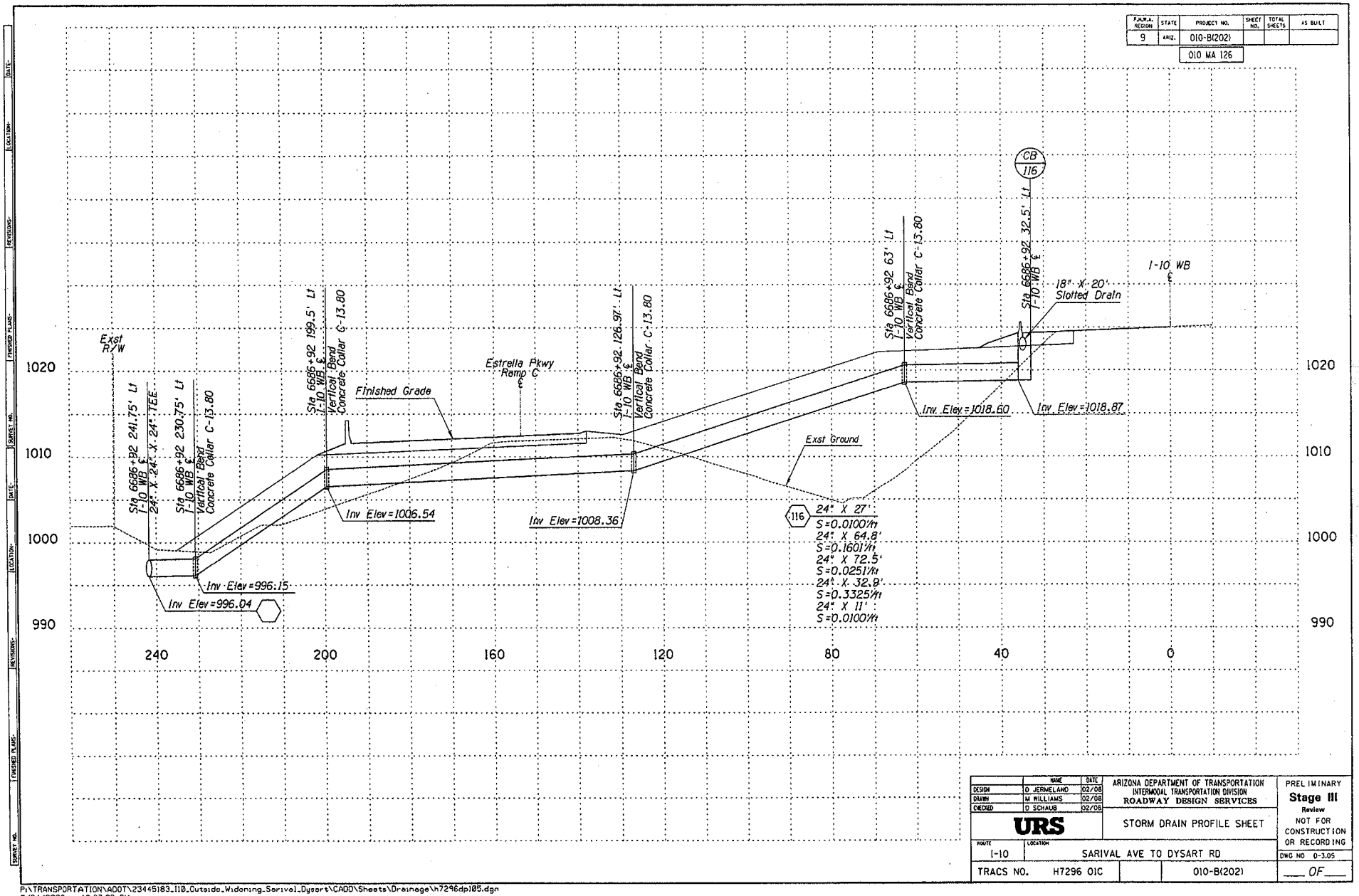

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE: I-10 | LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 0-3.05

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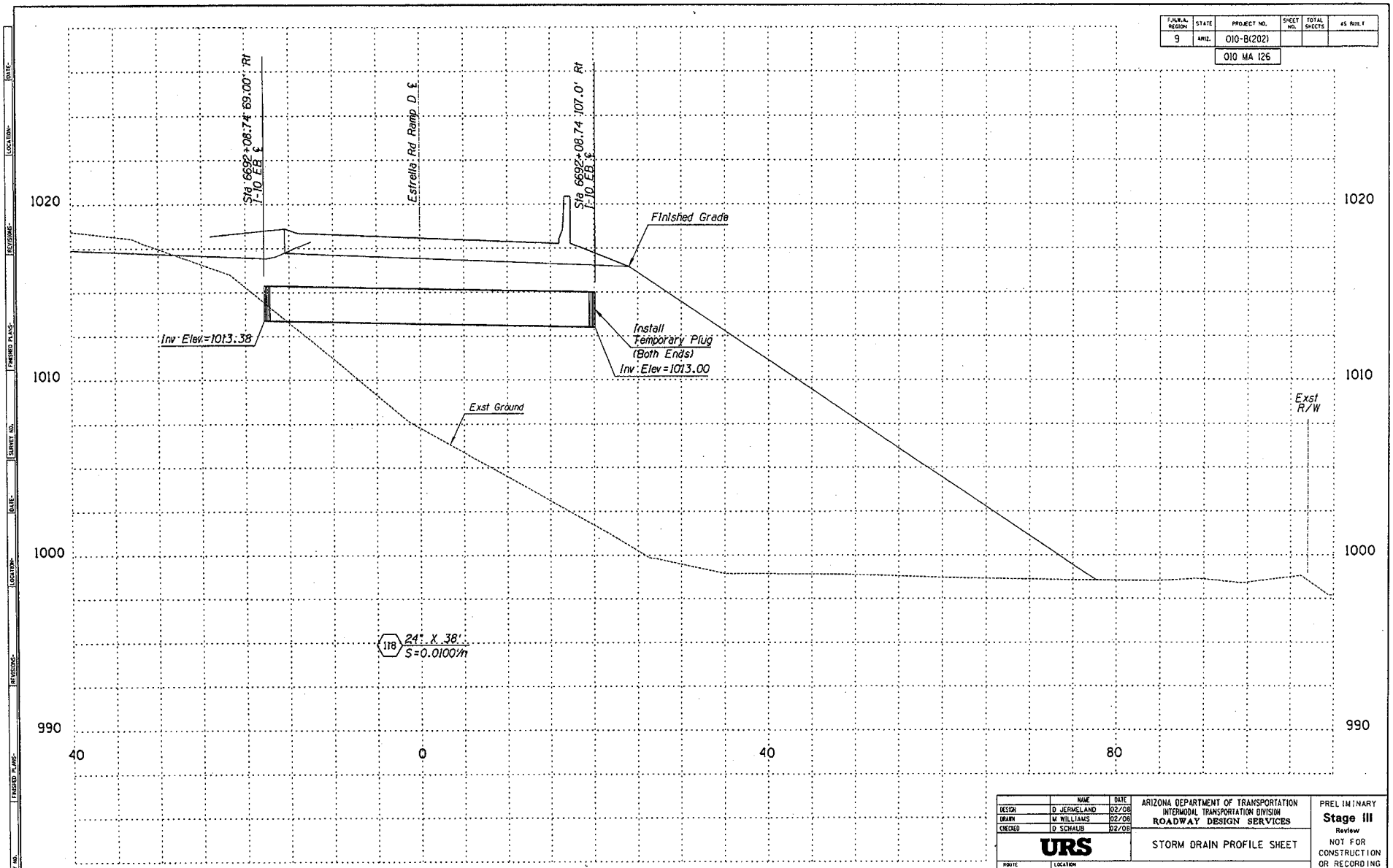

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	DWG NO. D-3.06
TRACS NO. H7296 01C		010-B(202) ___ OF ___

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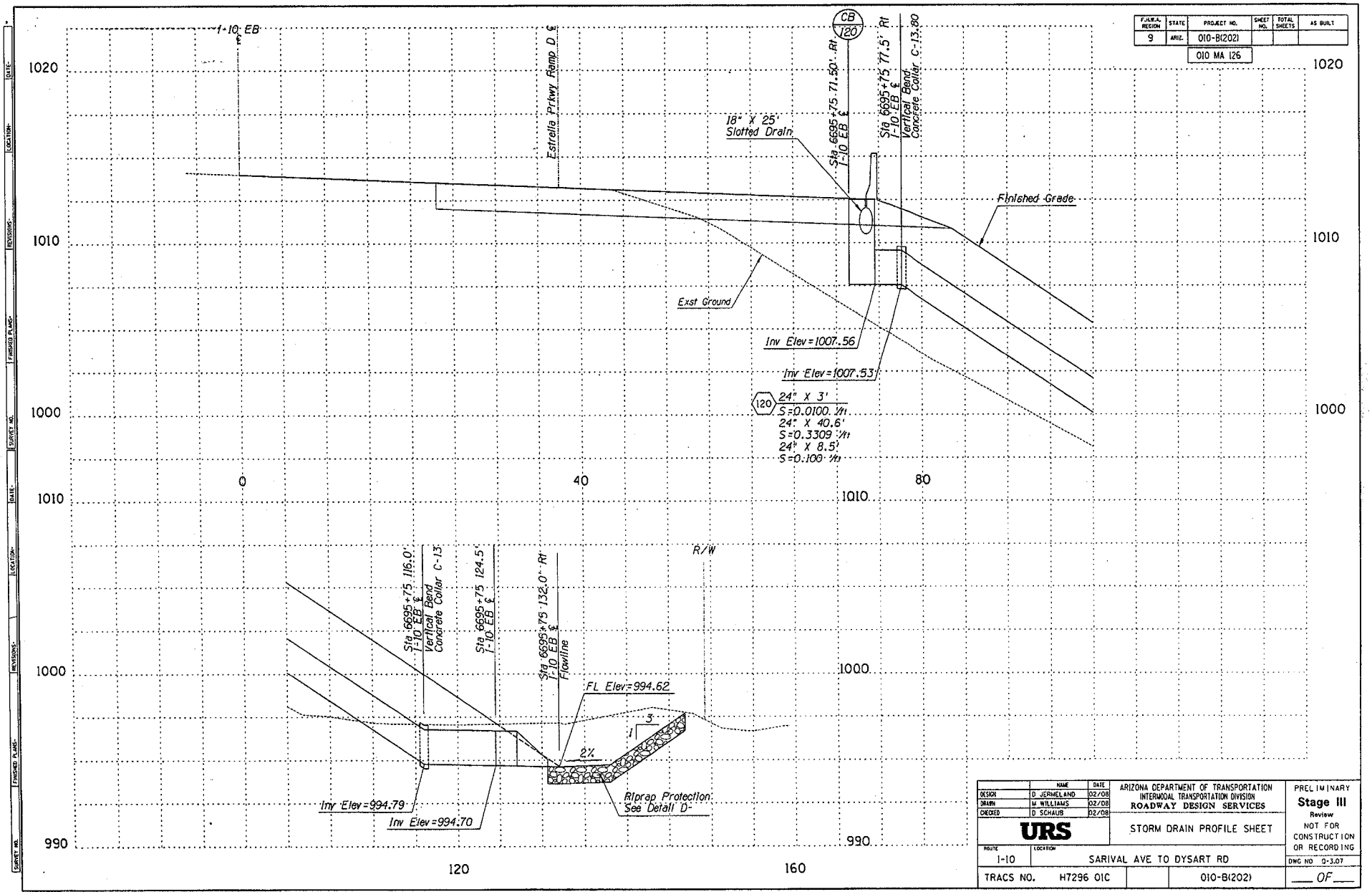

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 9-3.07

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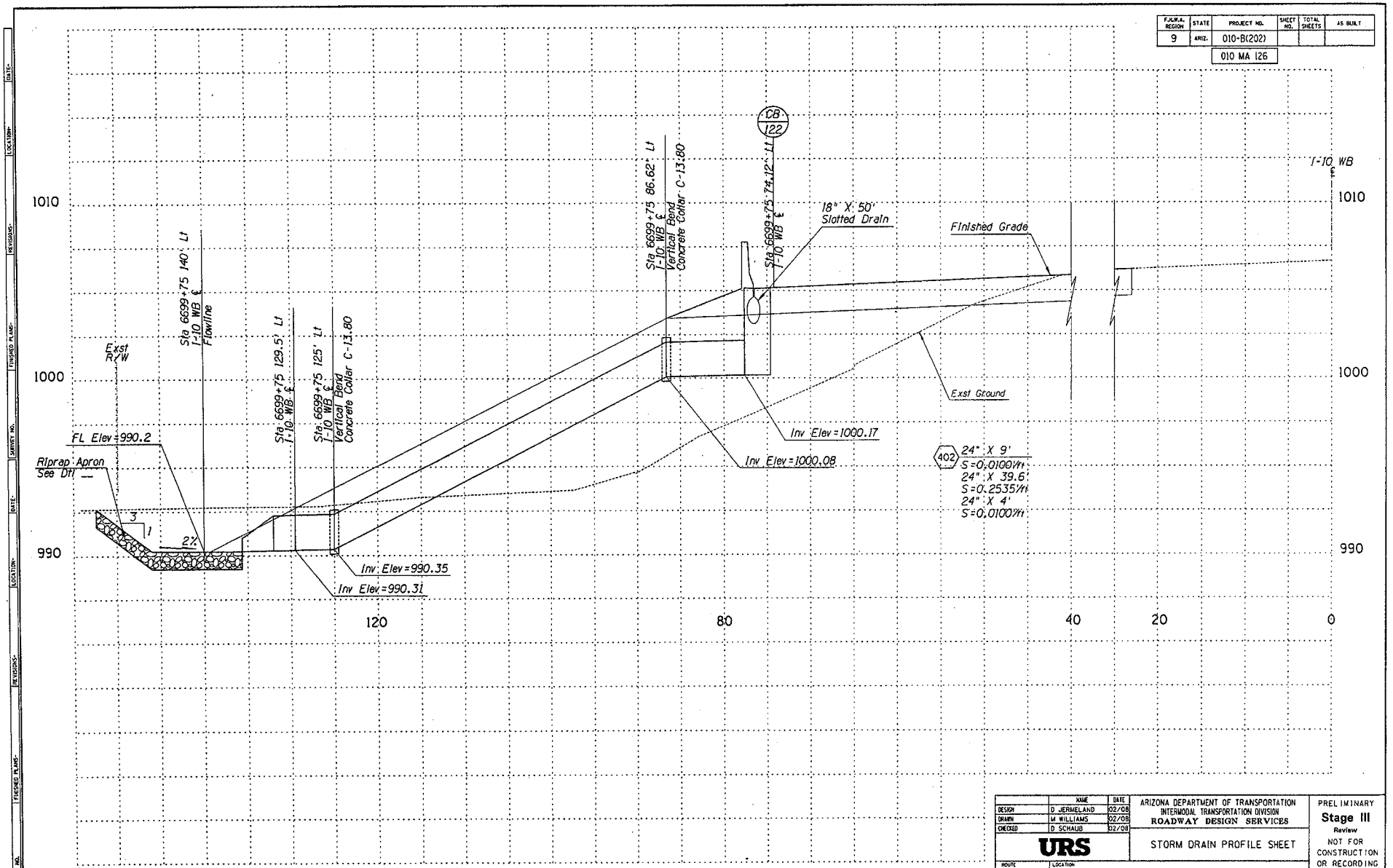

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	

DWG NO D-3.08

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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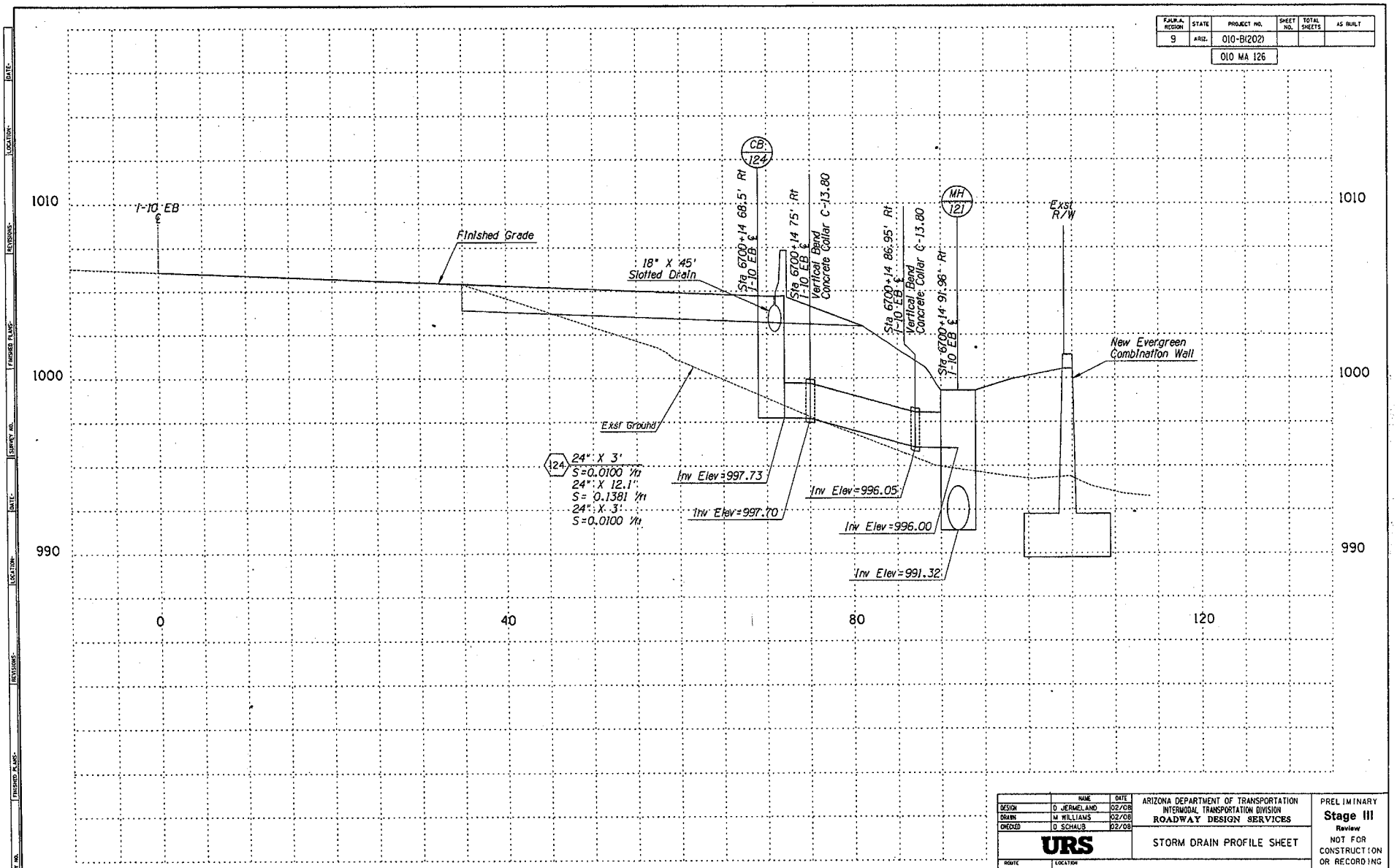

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.09

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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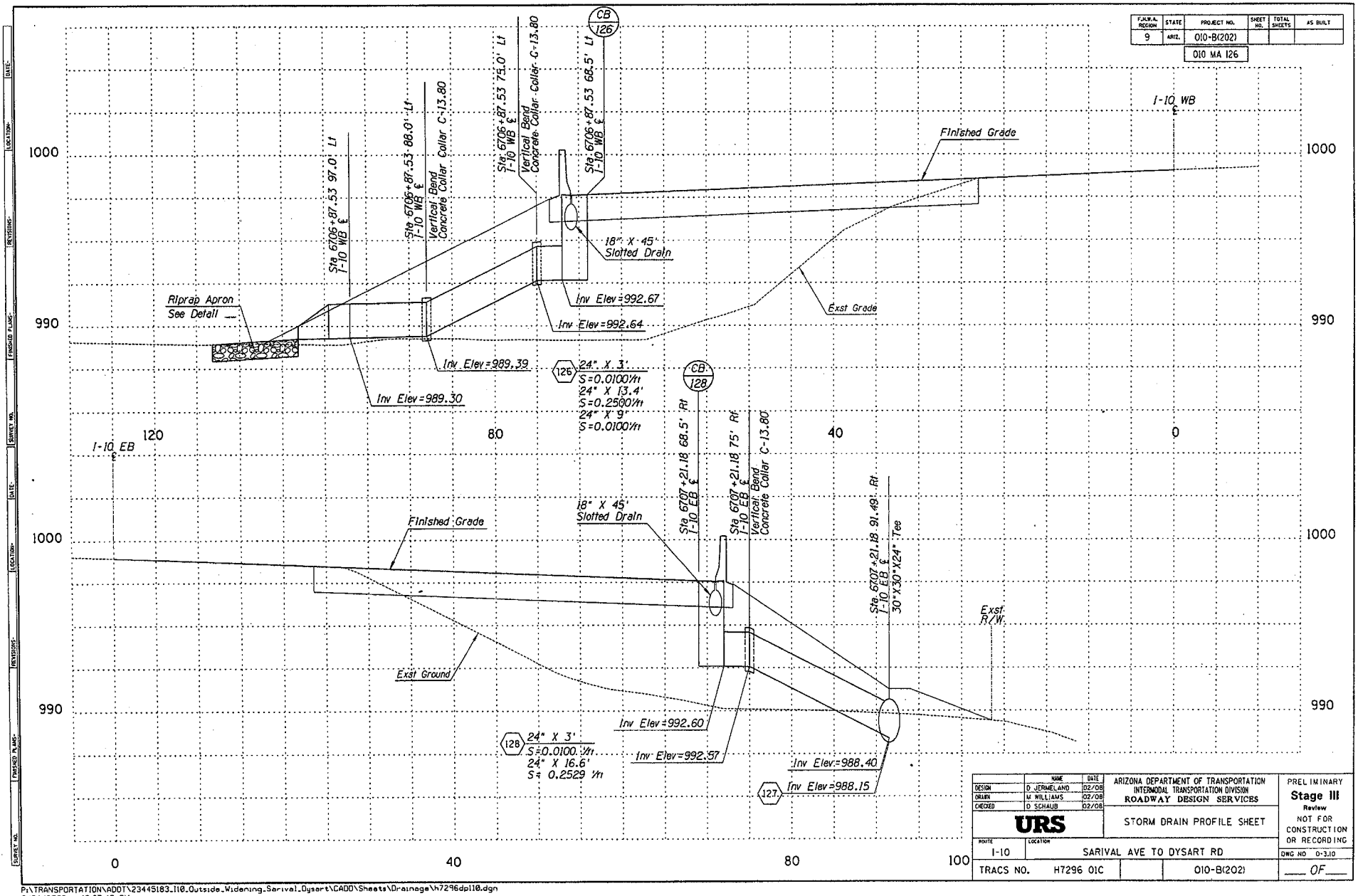

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.10
TRACS NO.	H7296 01C	010-B(202)

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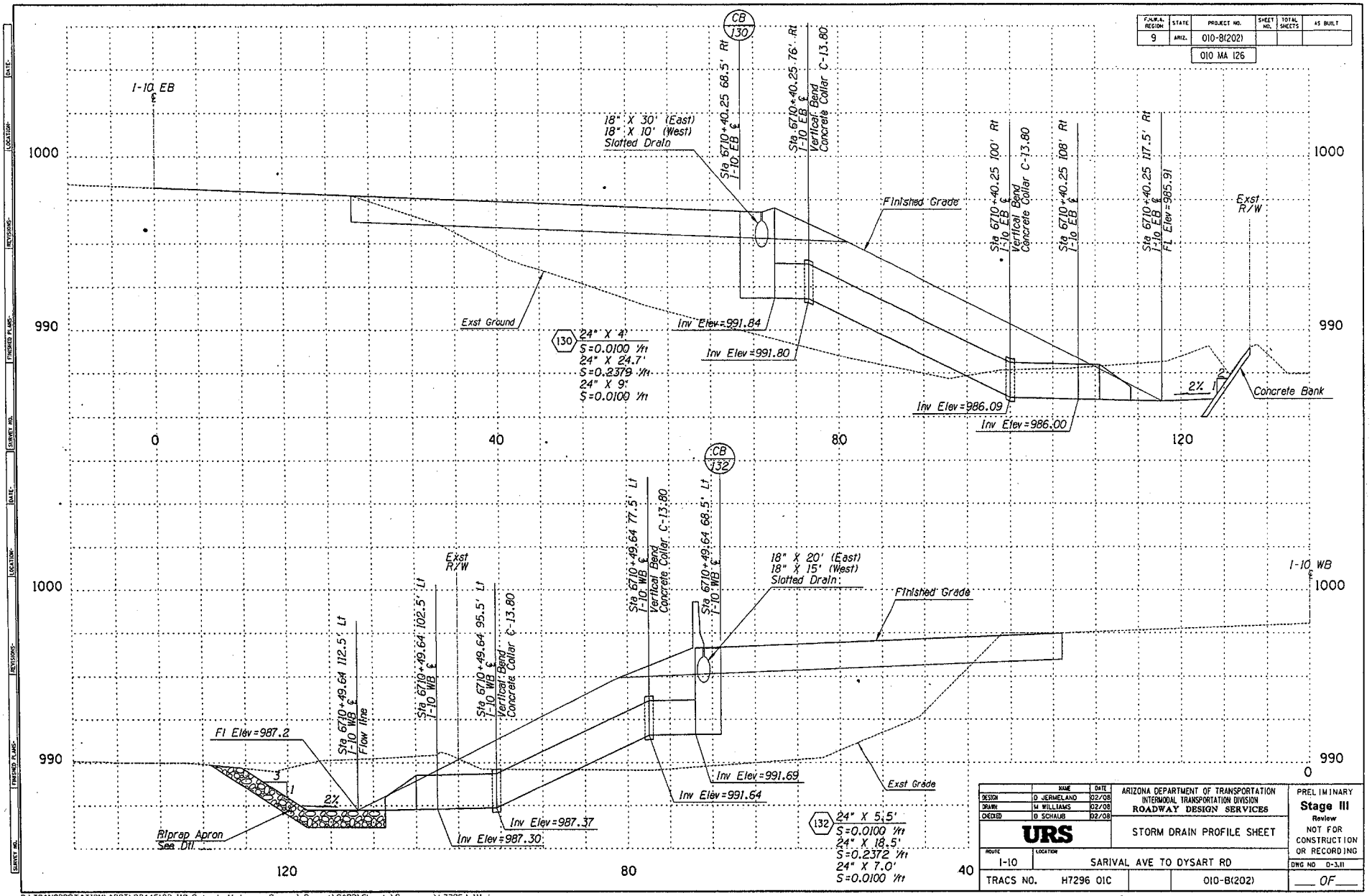

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.11

___ OF ___

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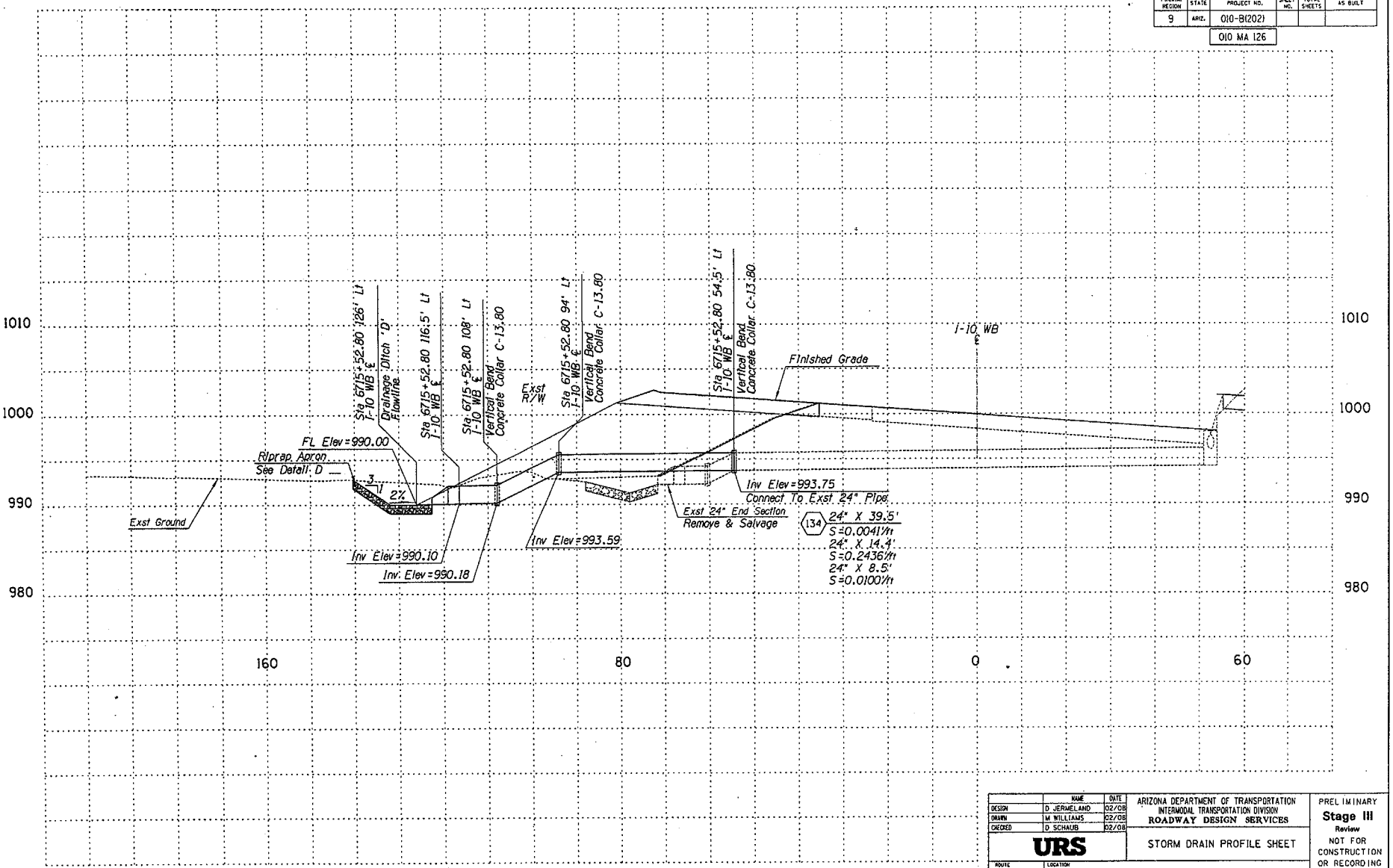

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.12

___ OF ___

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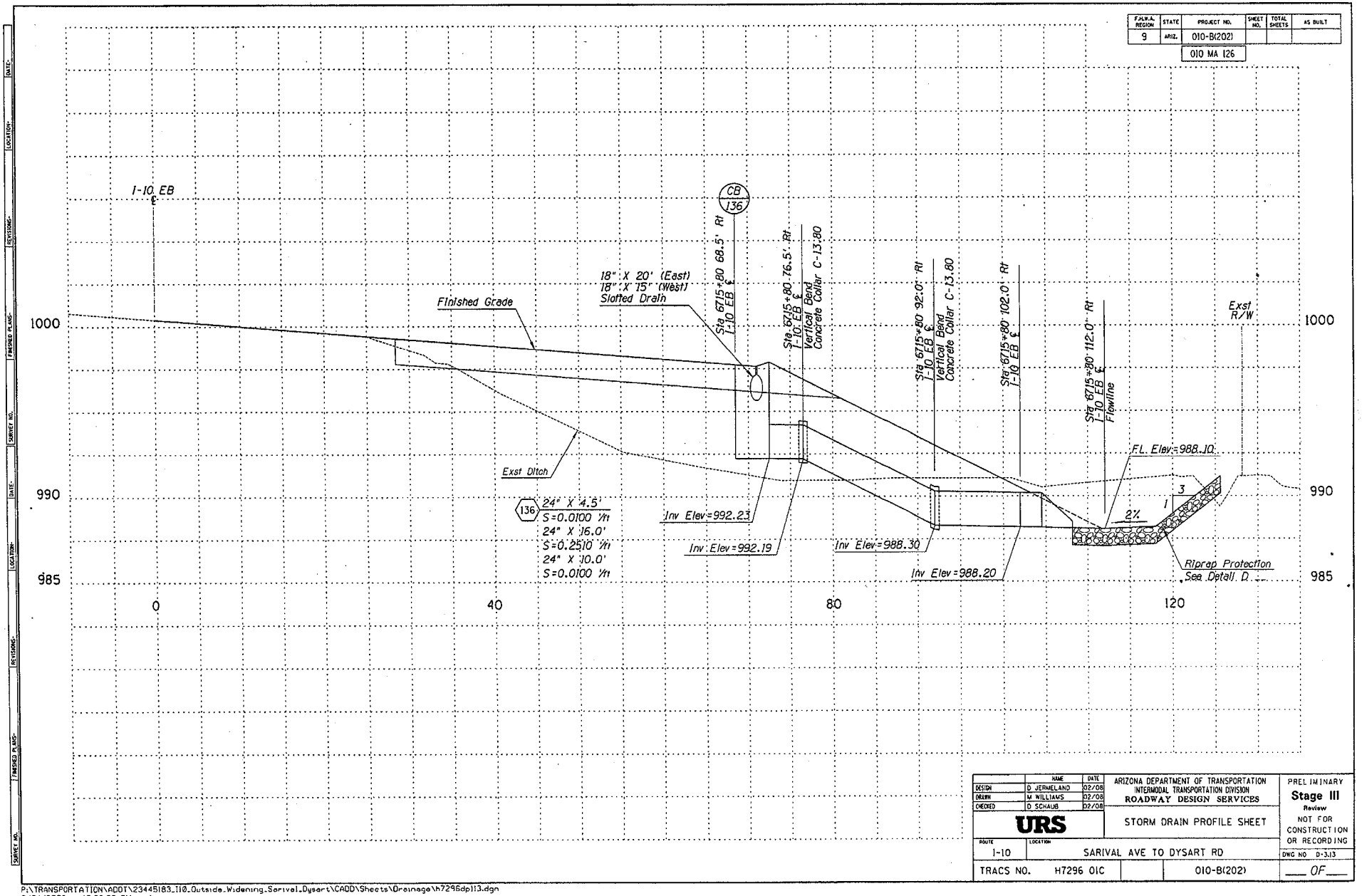
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.13

TRACS NO.			SHEET NO. OF
H7296 01C		010-B(202)	___ OF ___

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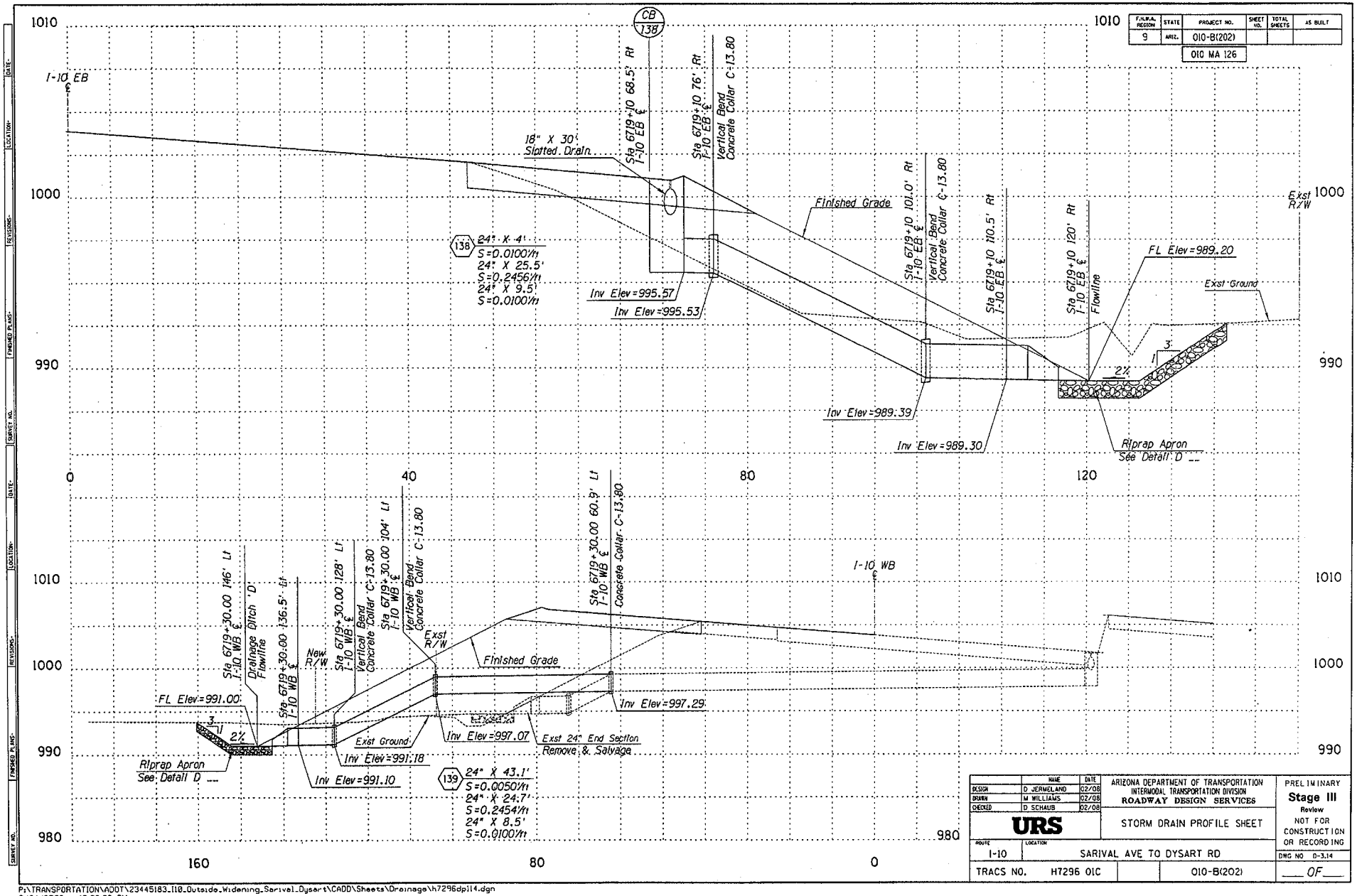

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C		010-B(202)

DWG NO D-3.14

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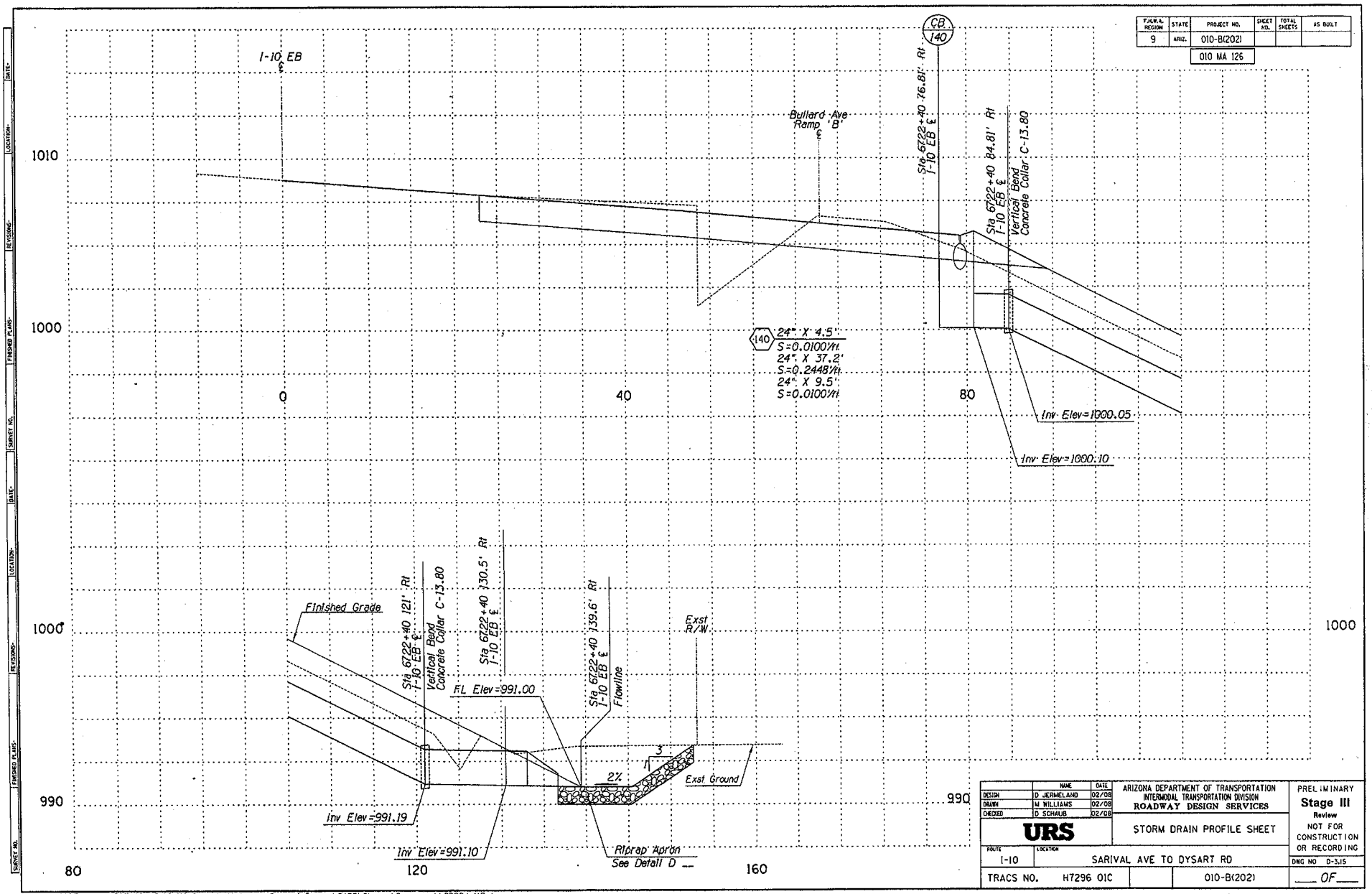

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.15

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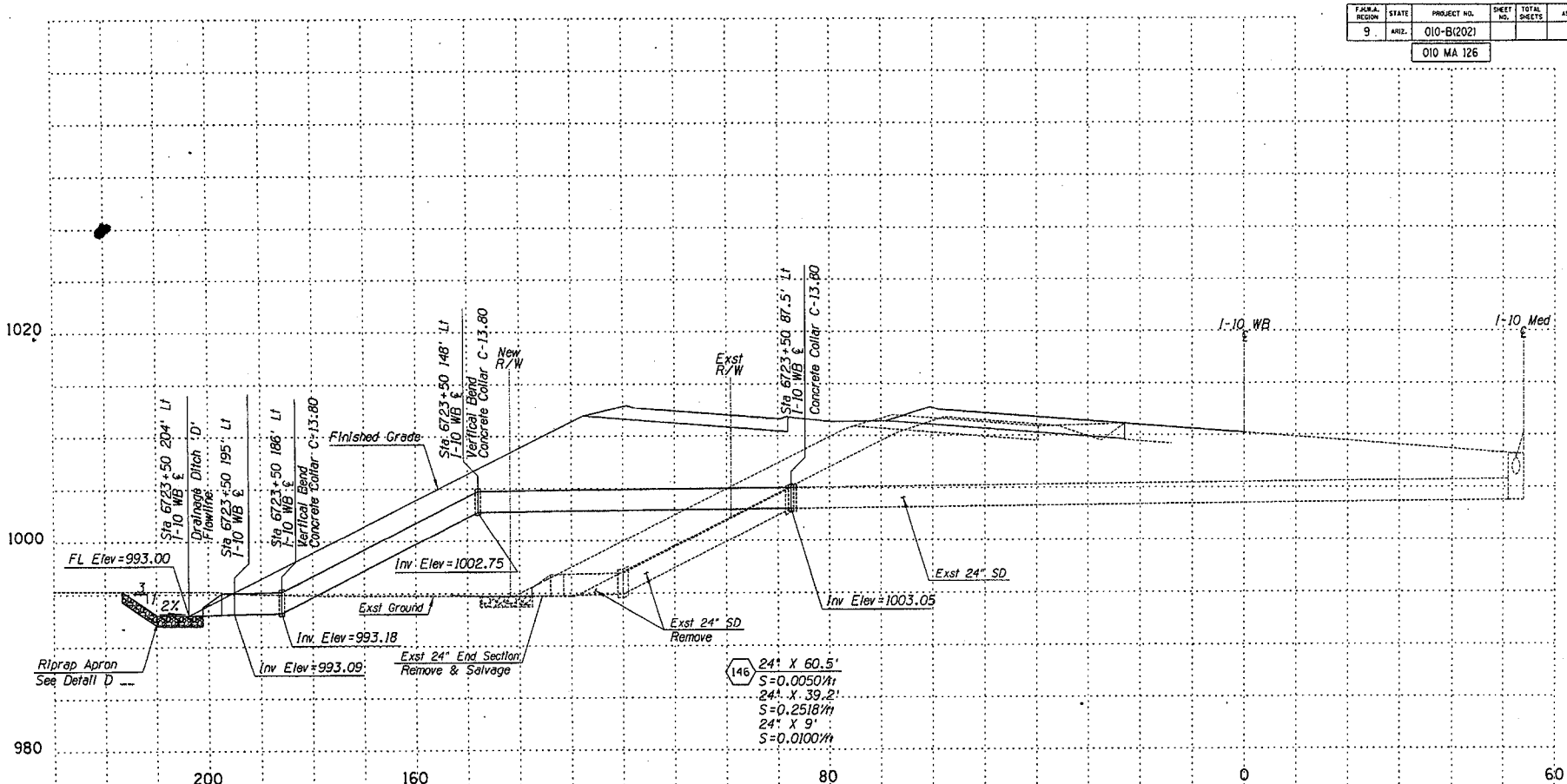
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.16

___ OF ___

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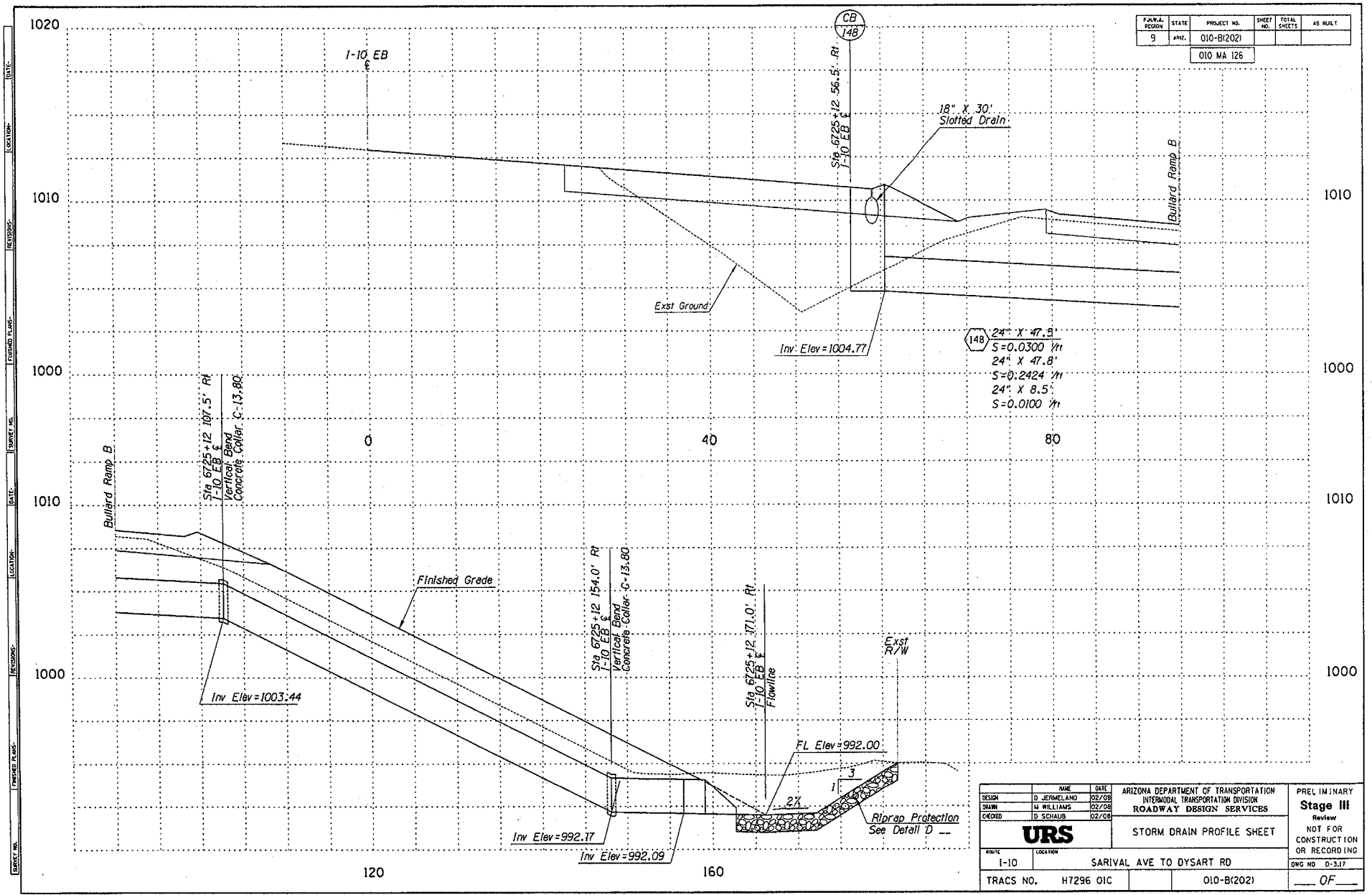

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.17

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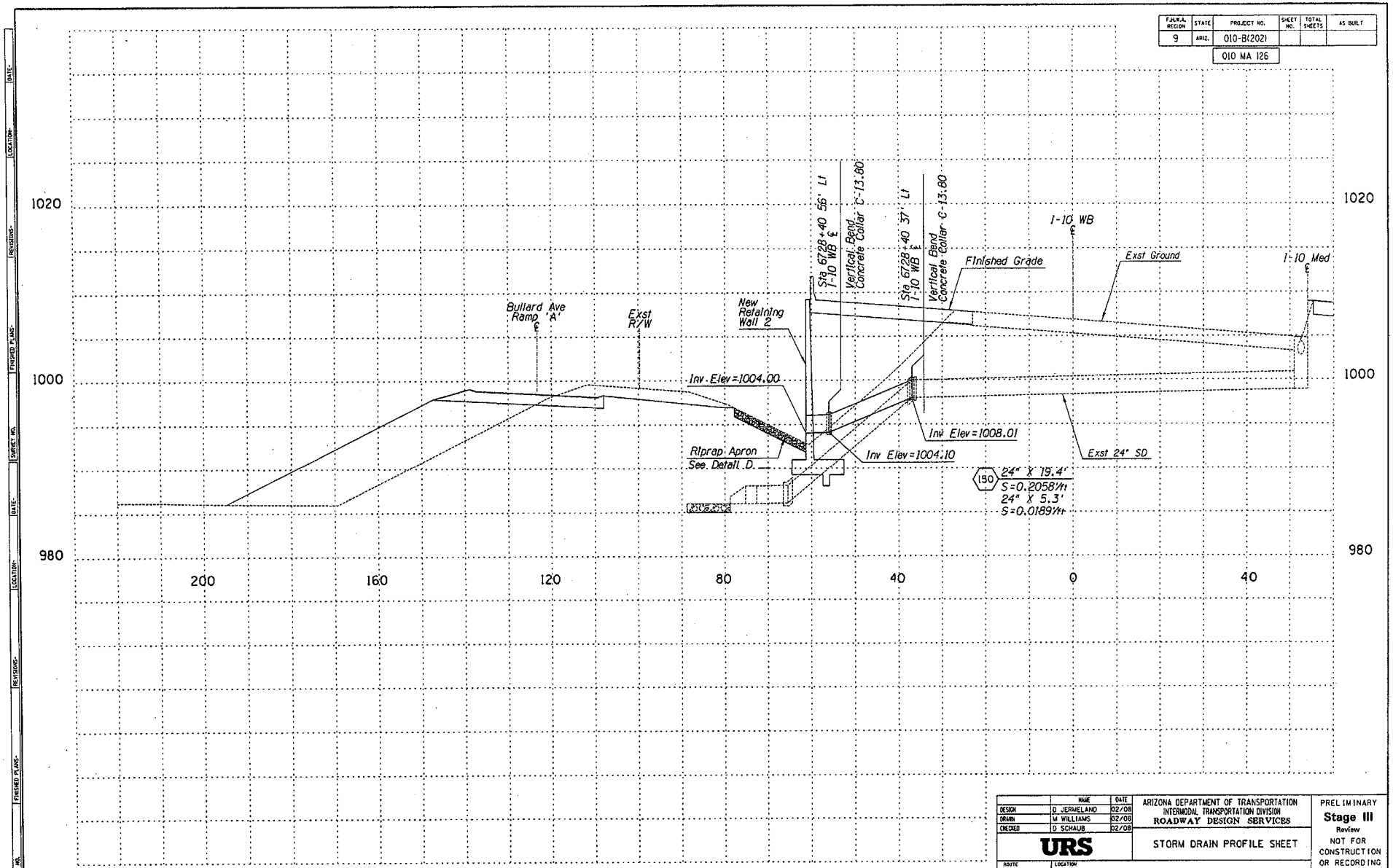

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202) 010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.18

TRACS NO.			
H7296 01C		010-B(202)	___ OF ___

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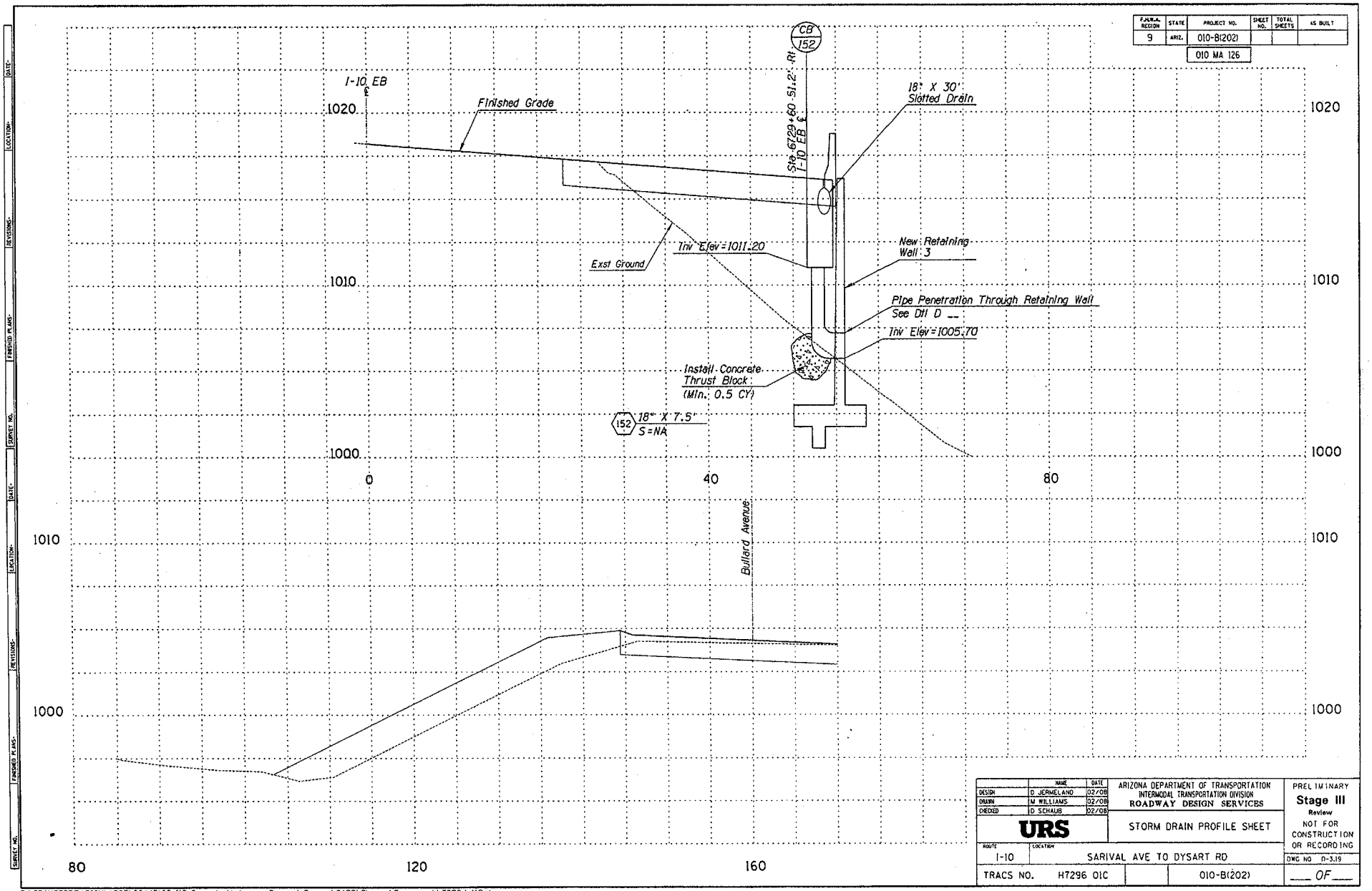

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE: I-10 LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.19

___ OF ___

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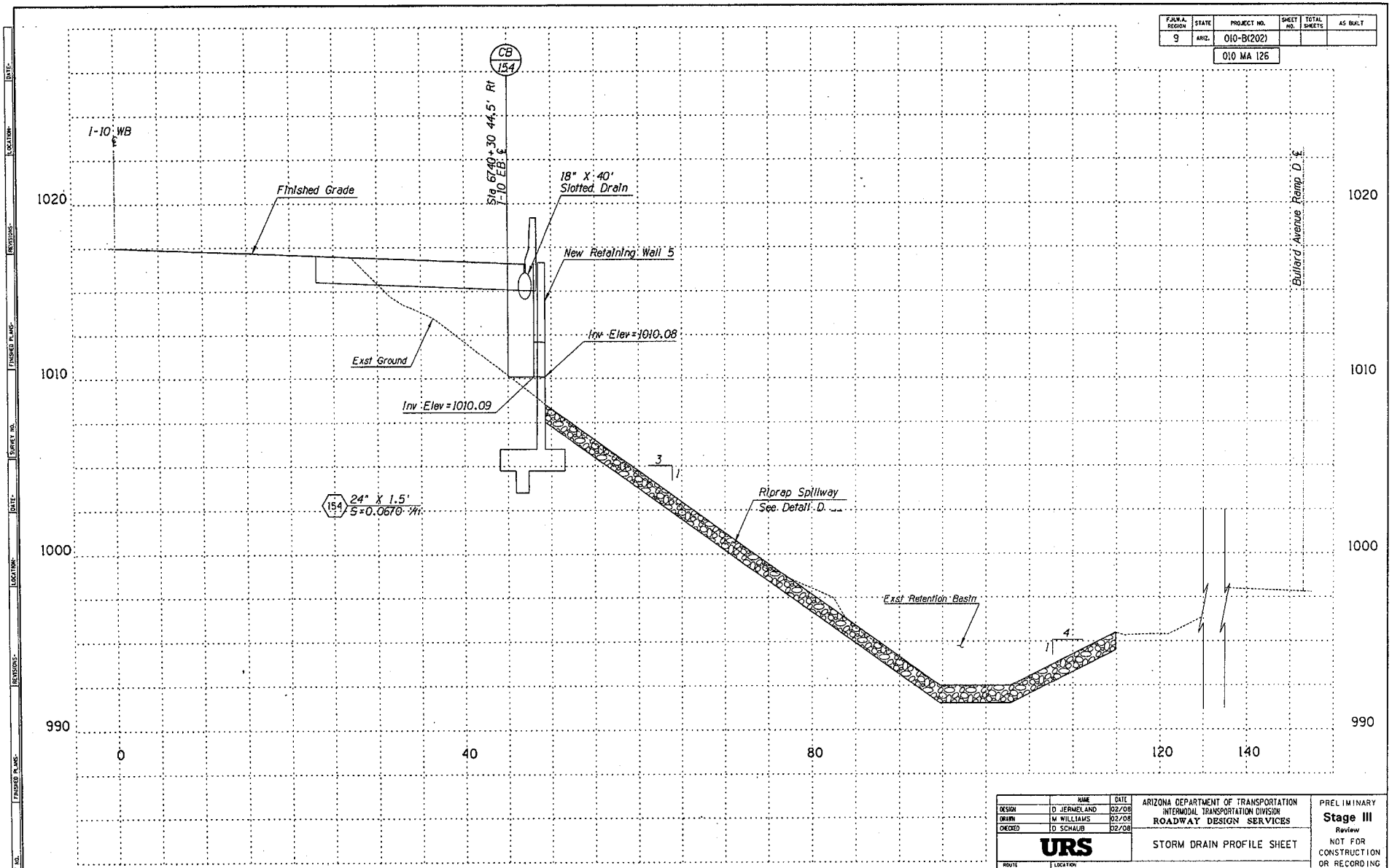

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	DWG NO D-3.20

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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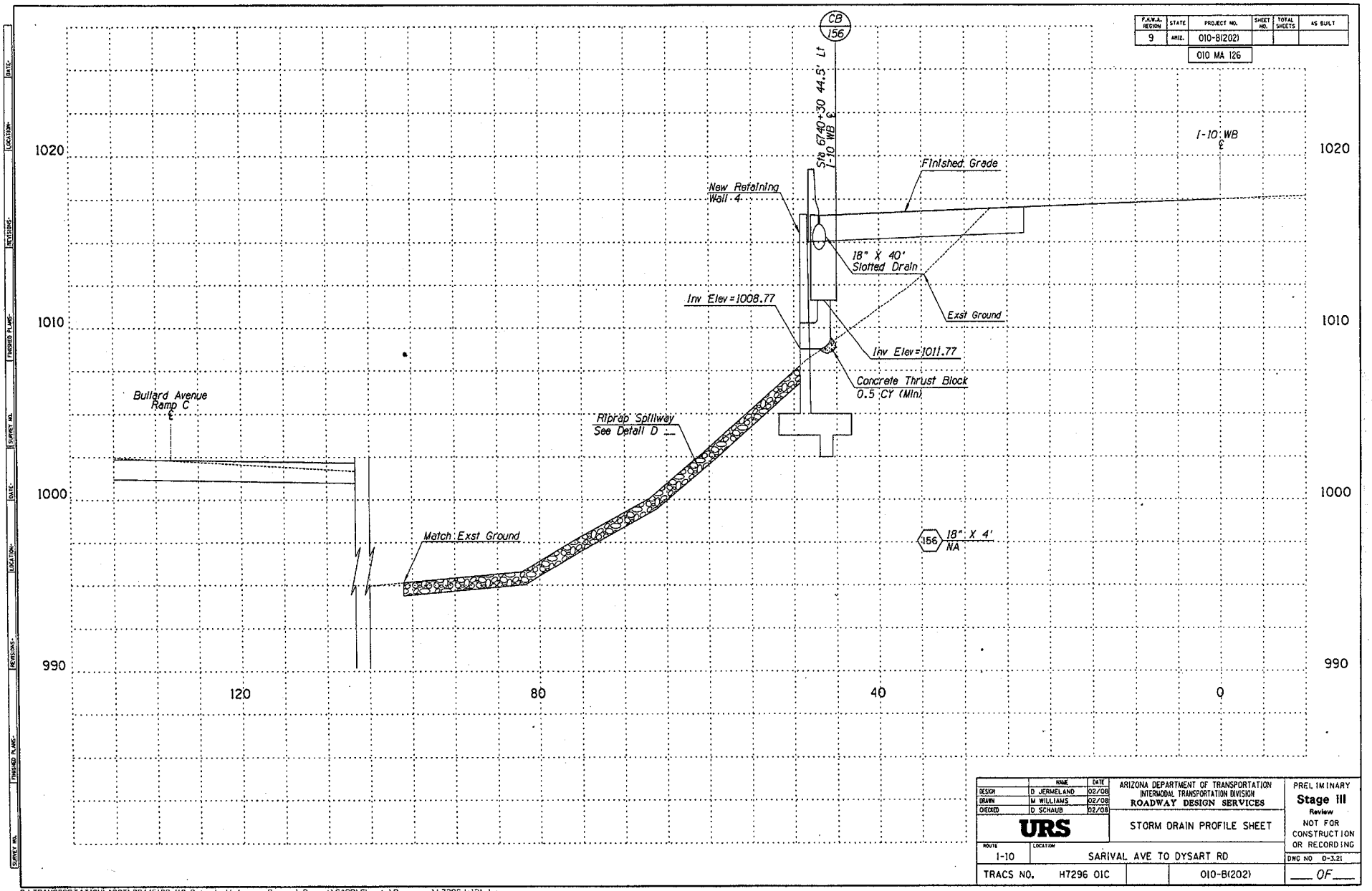

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-3.21

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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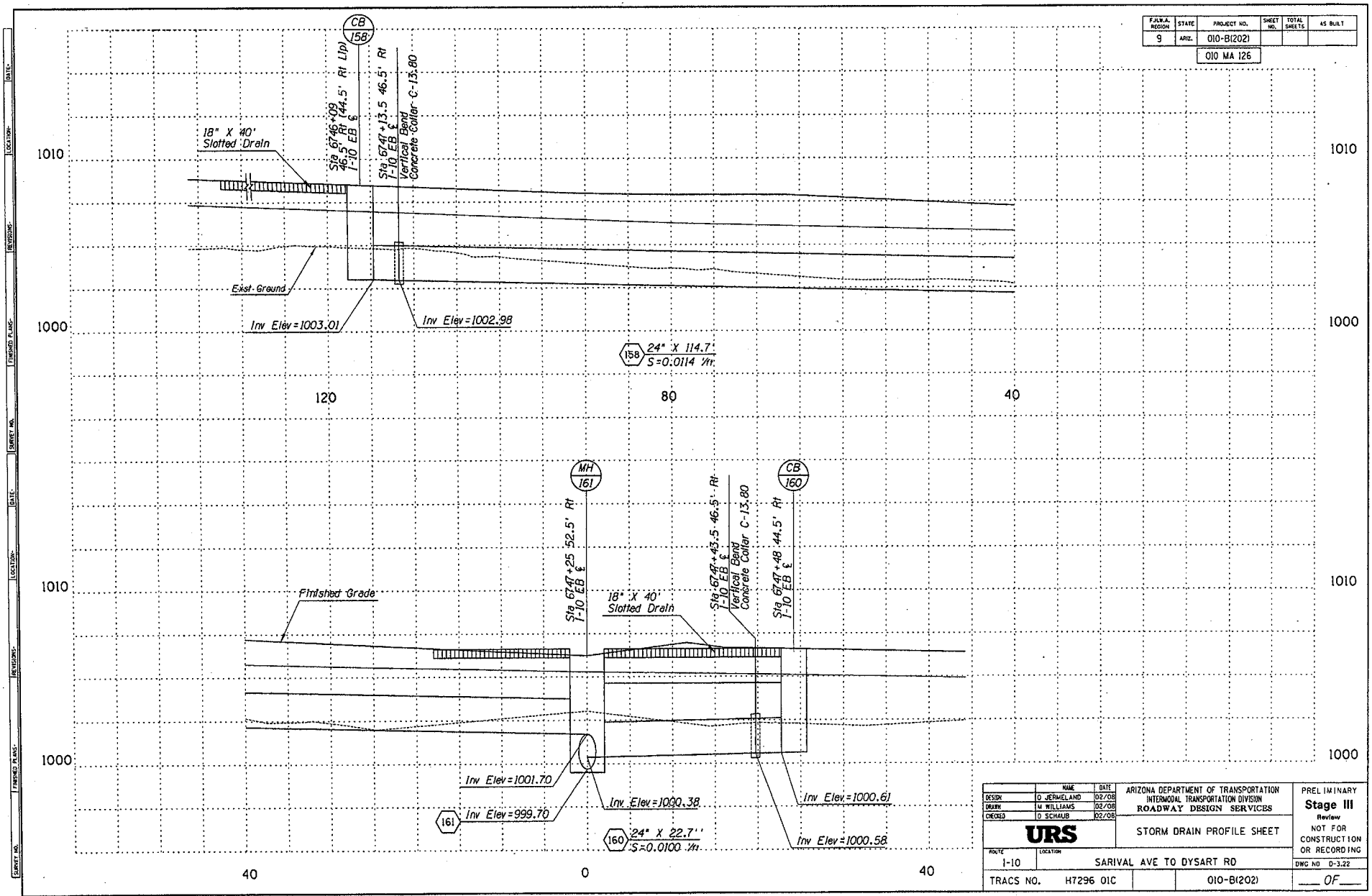

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.22

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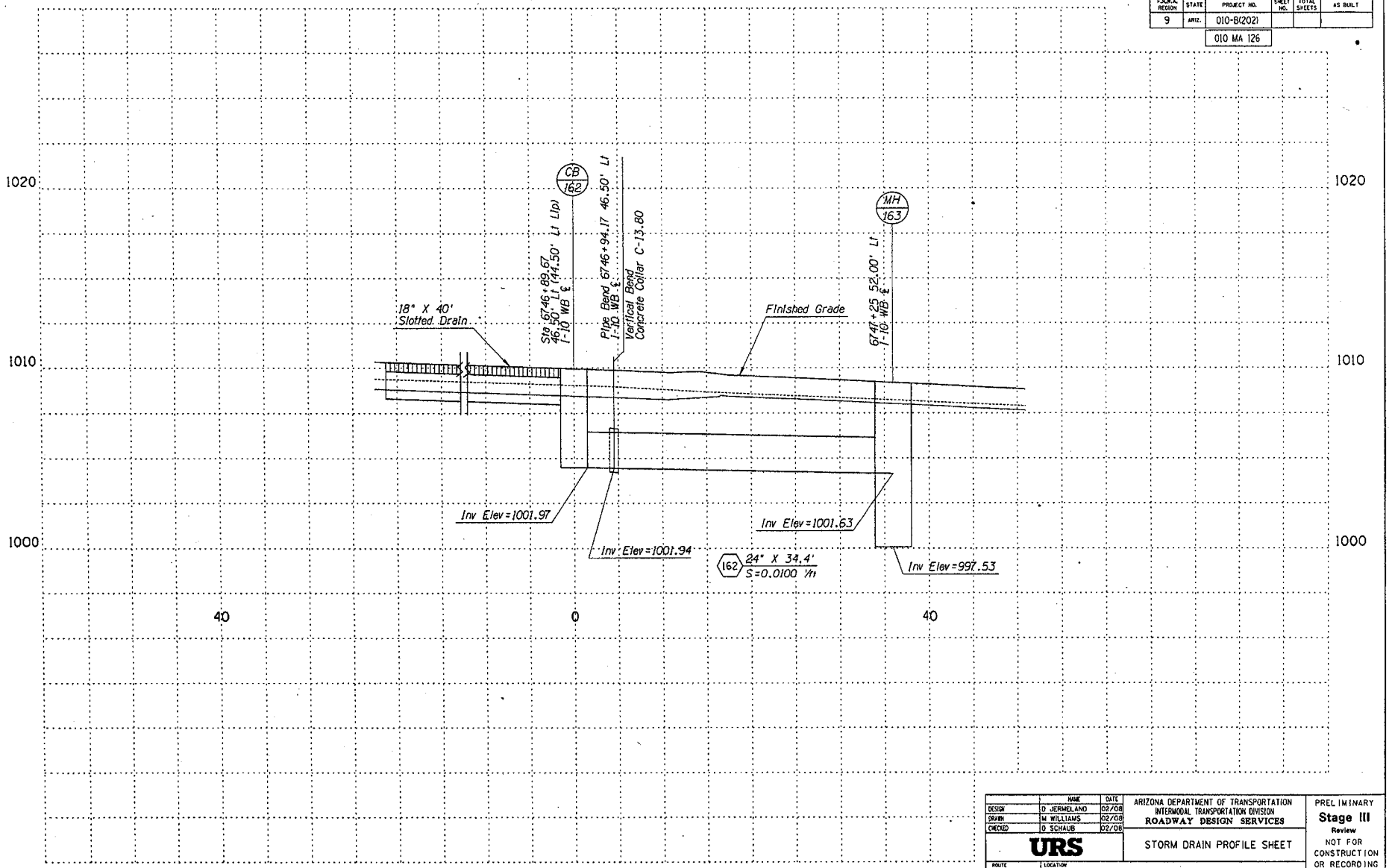
F.A.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.23

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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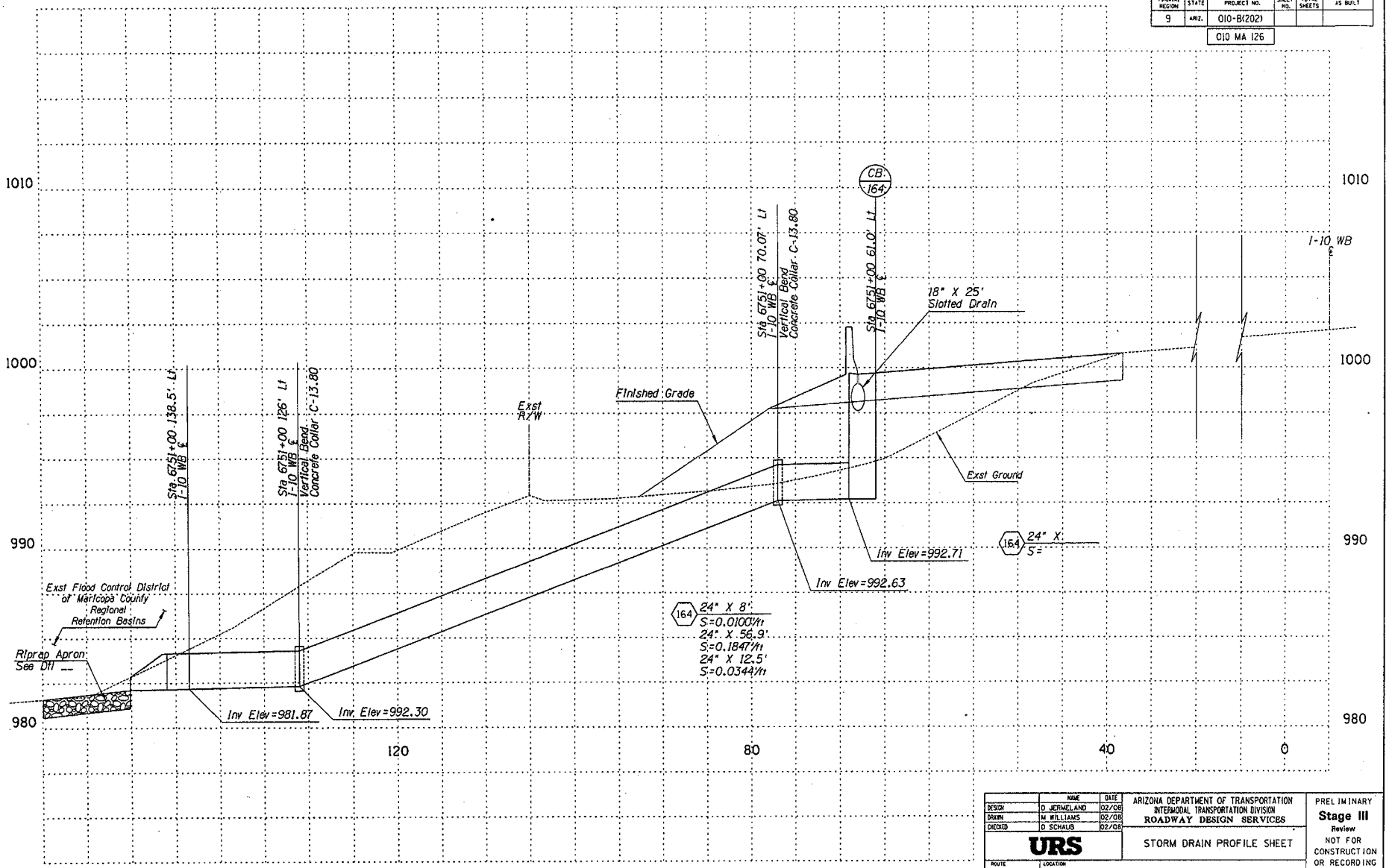

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-15.24

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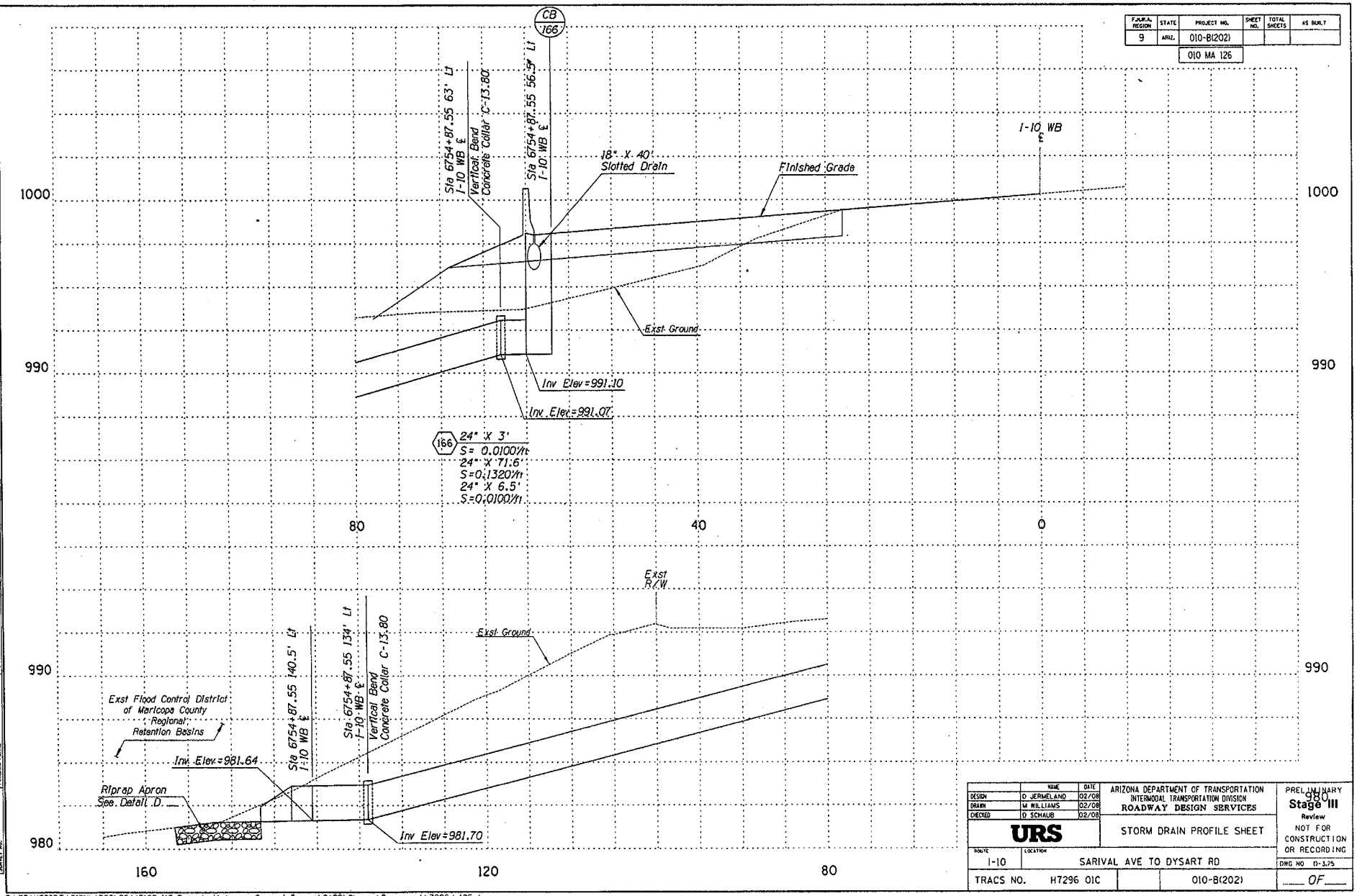

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	W. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO. D-1.75
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C	010-B(202)	___ OF ___

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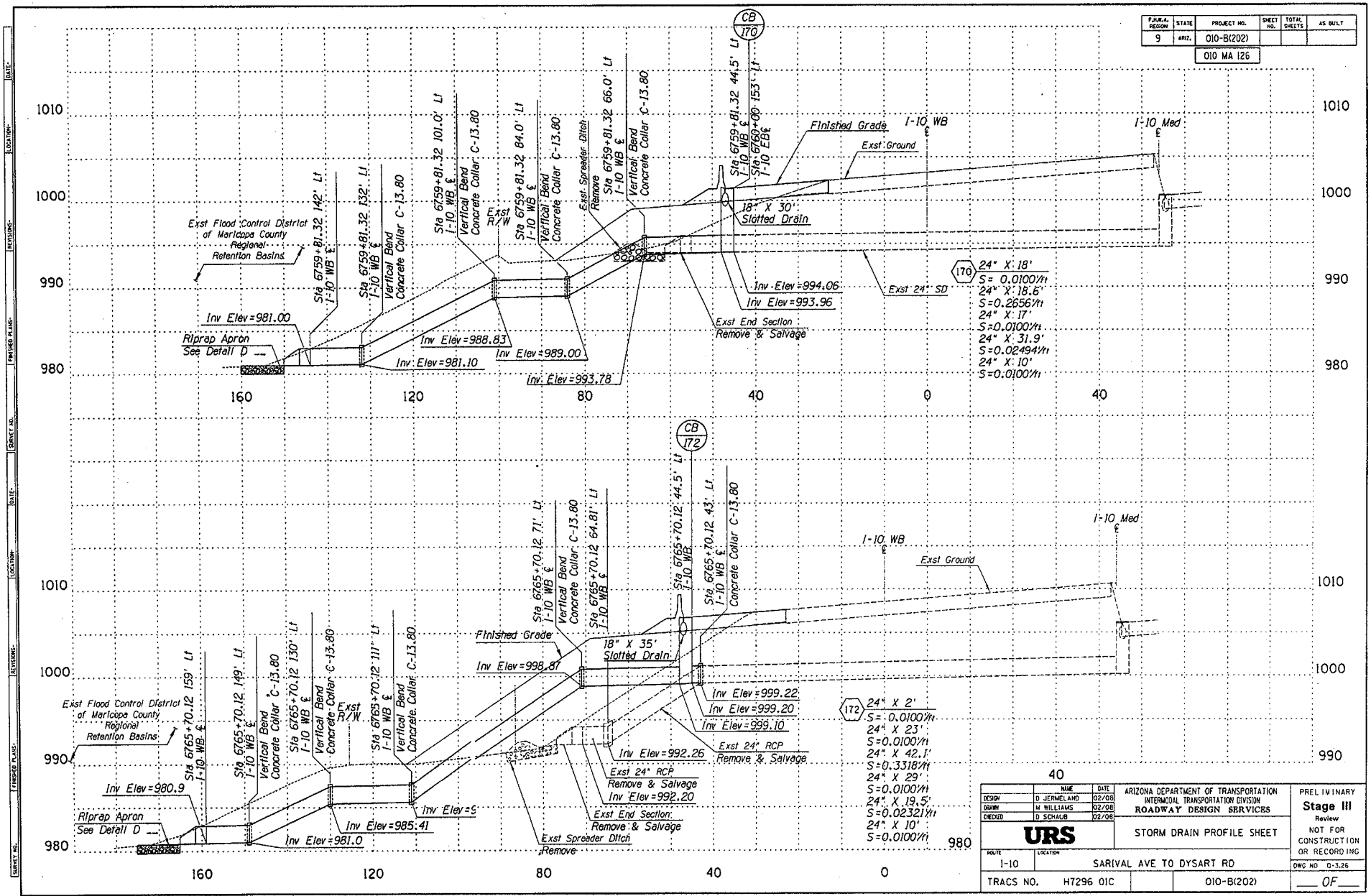

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		DWG NO C-3.26
TRACS NO.	H7296 01C		010-B(202)

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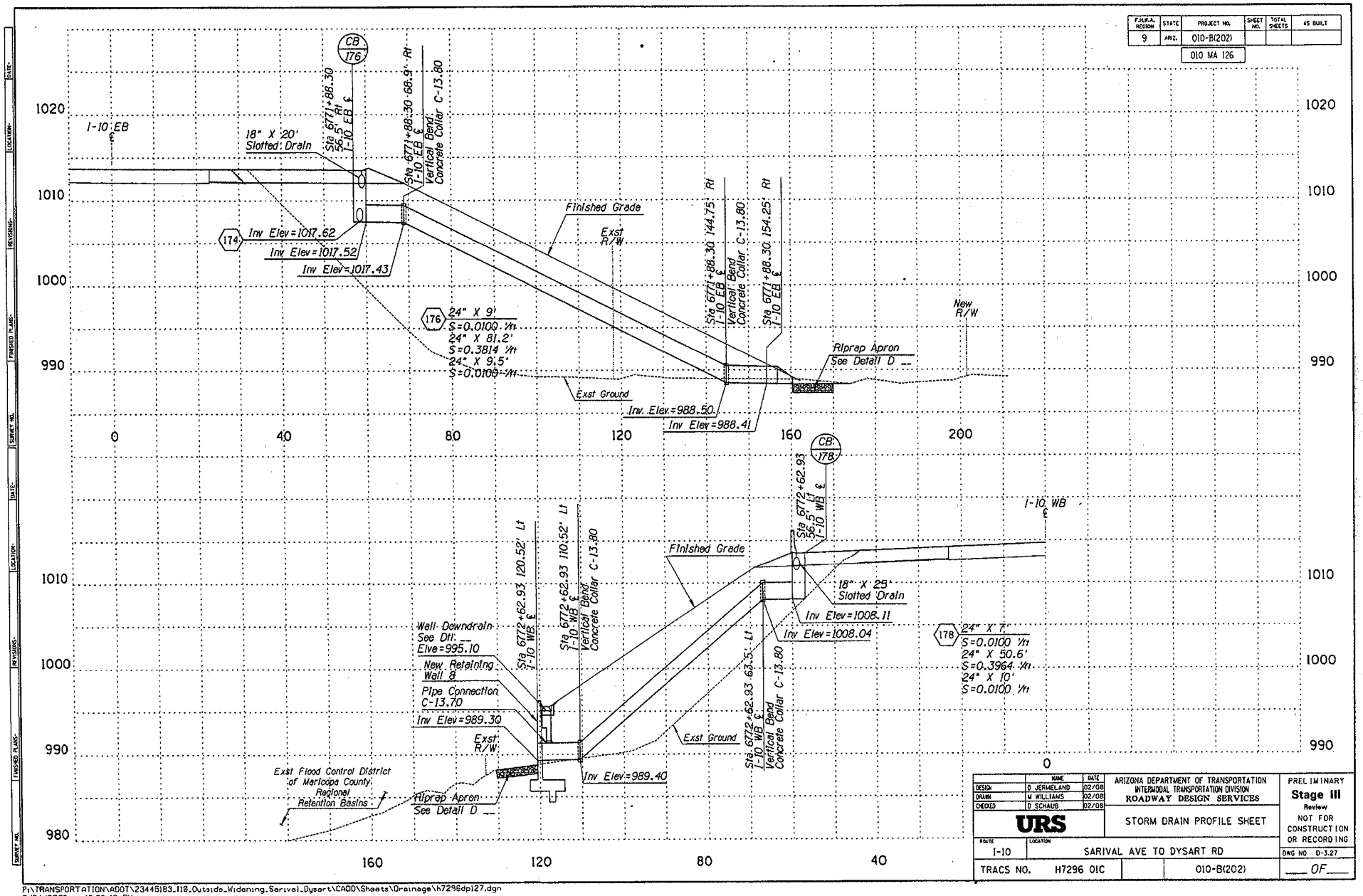

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO D-3.27
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C	010-B(202)	___ OF ___

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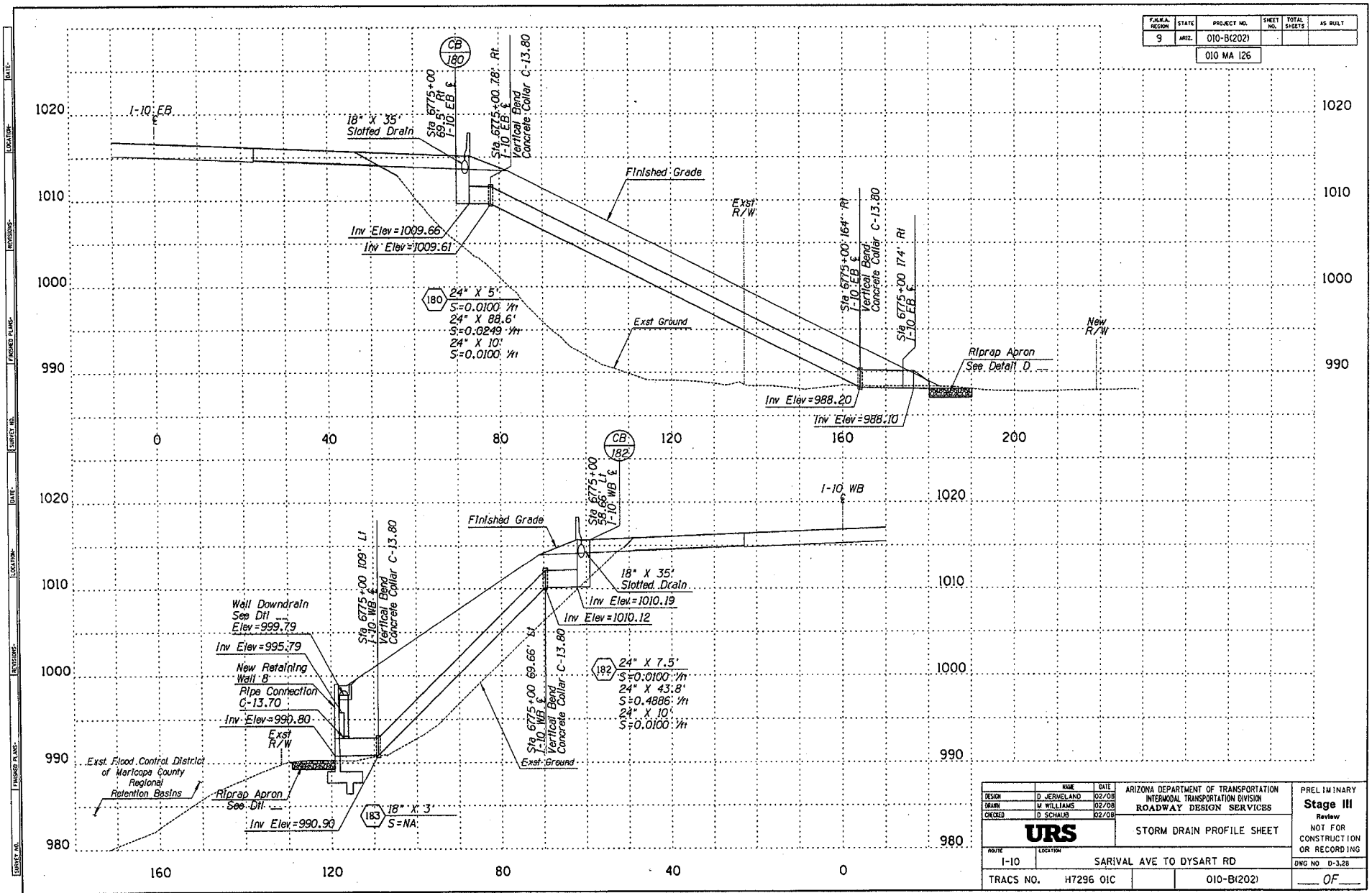

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.28

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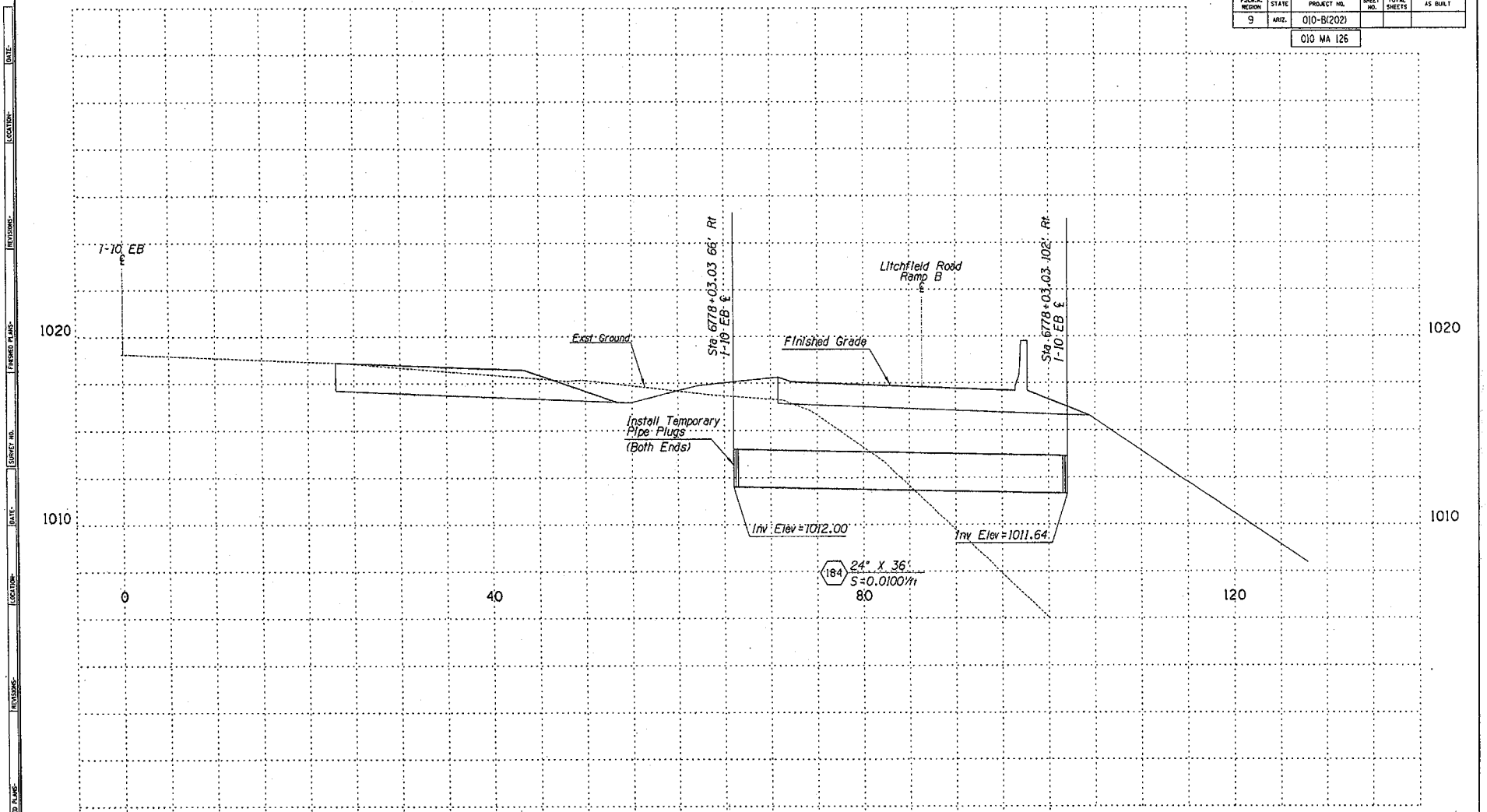
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-3.29

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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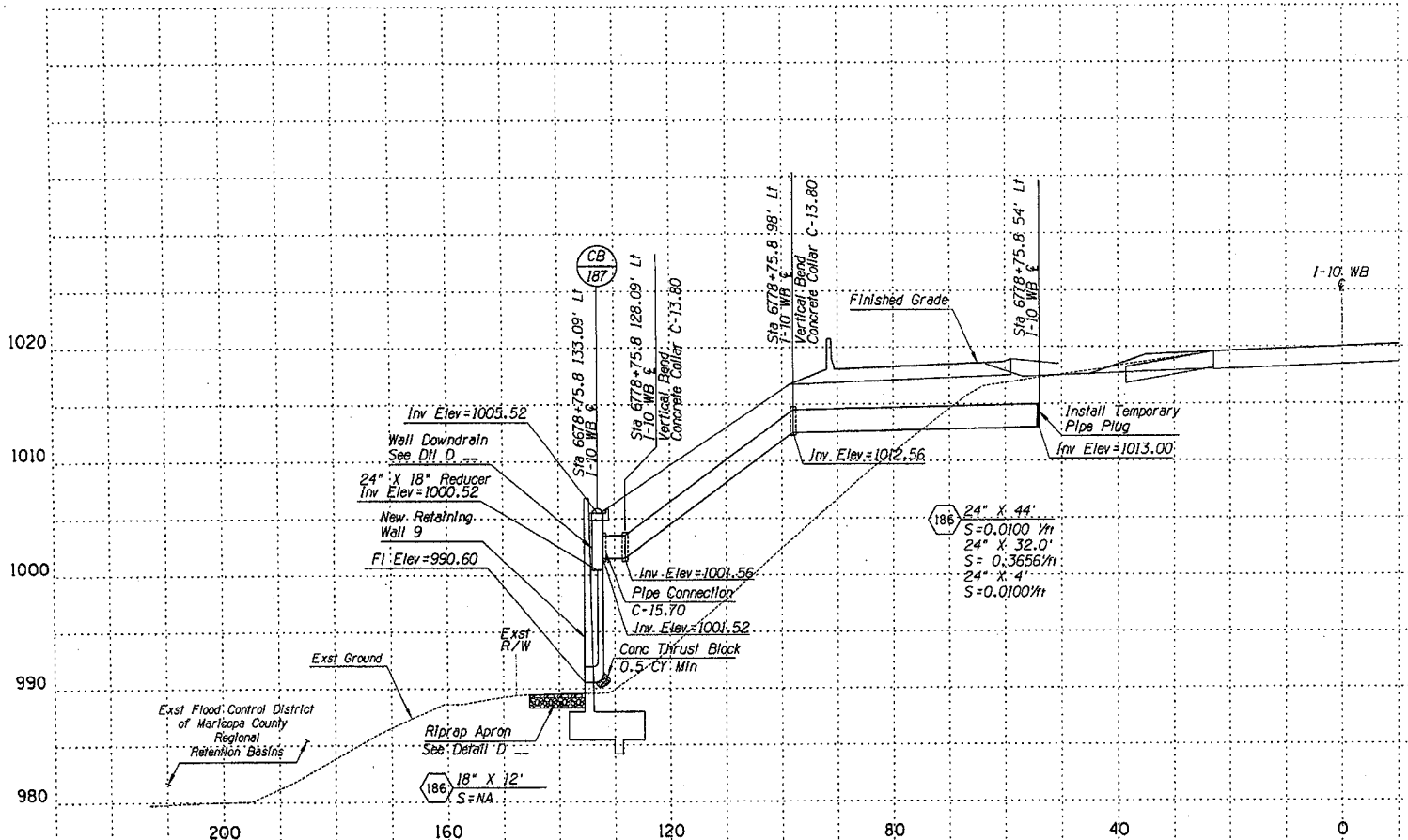
F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.30

TRACS NO.			SHEET
H7296 01C		010-B(202)	OF

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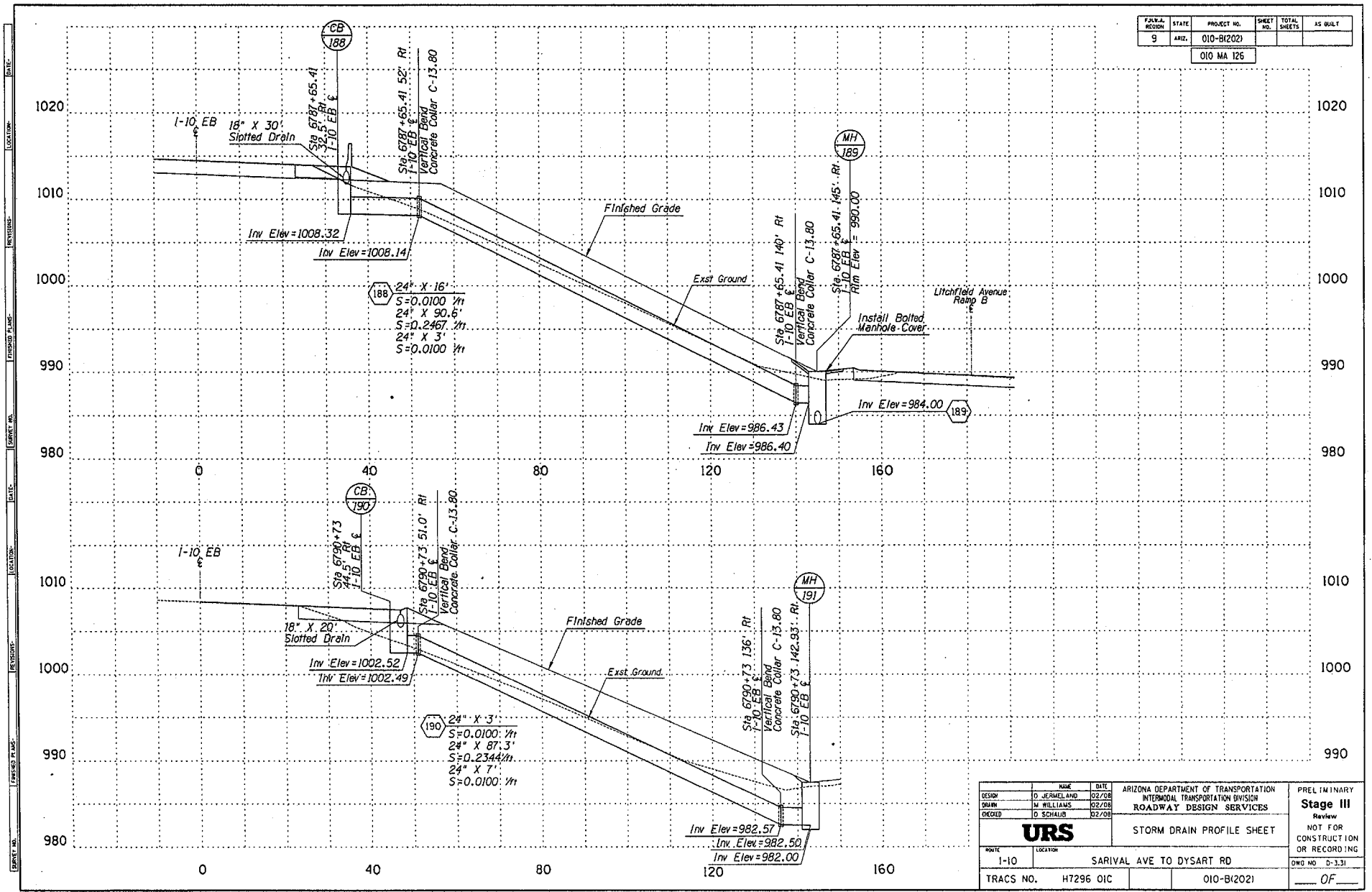

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C		010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.31

___ OF ___

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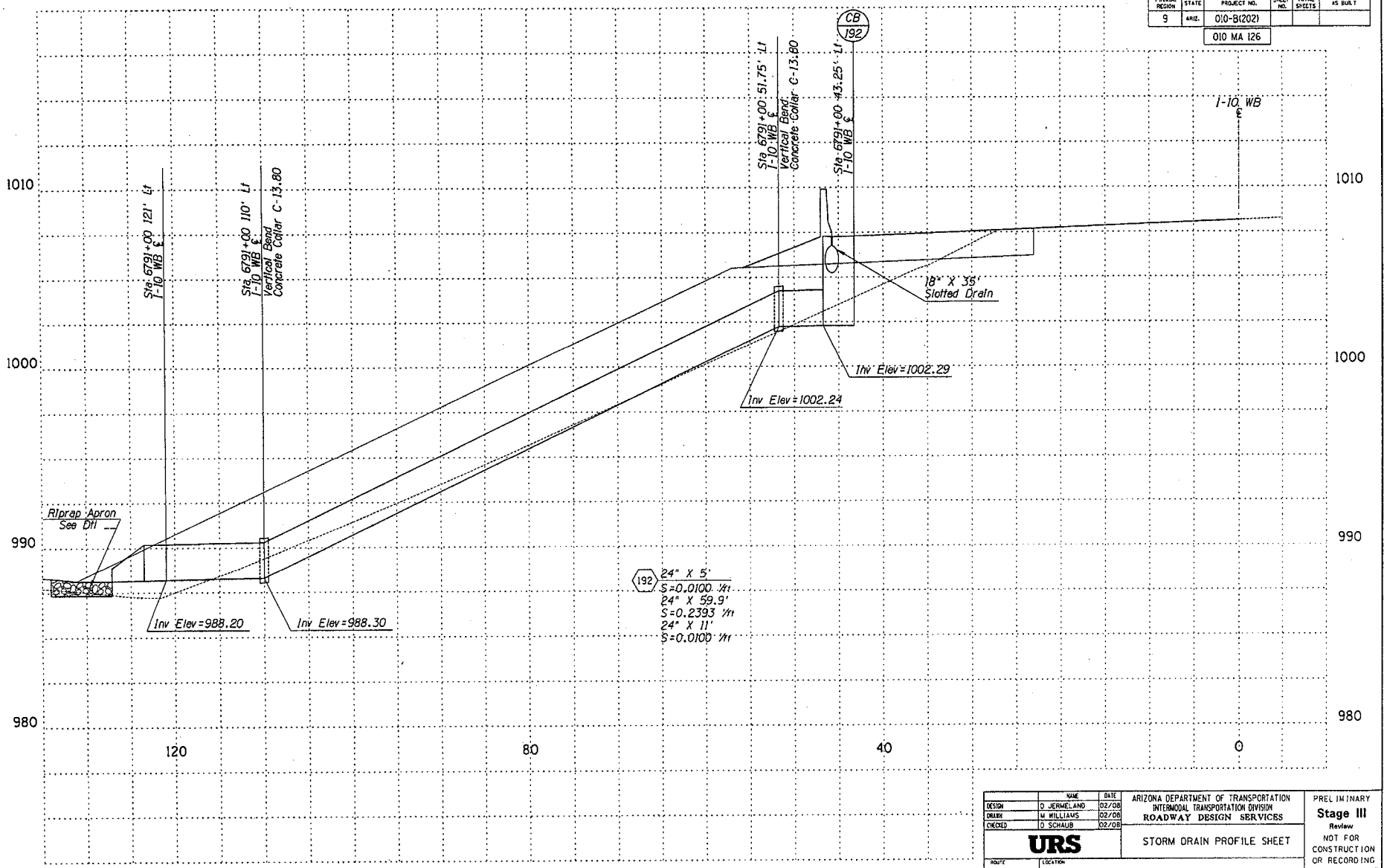

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.32

___ OF ___

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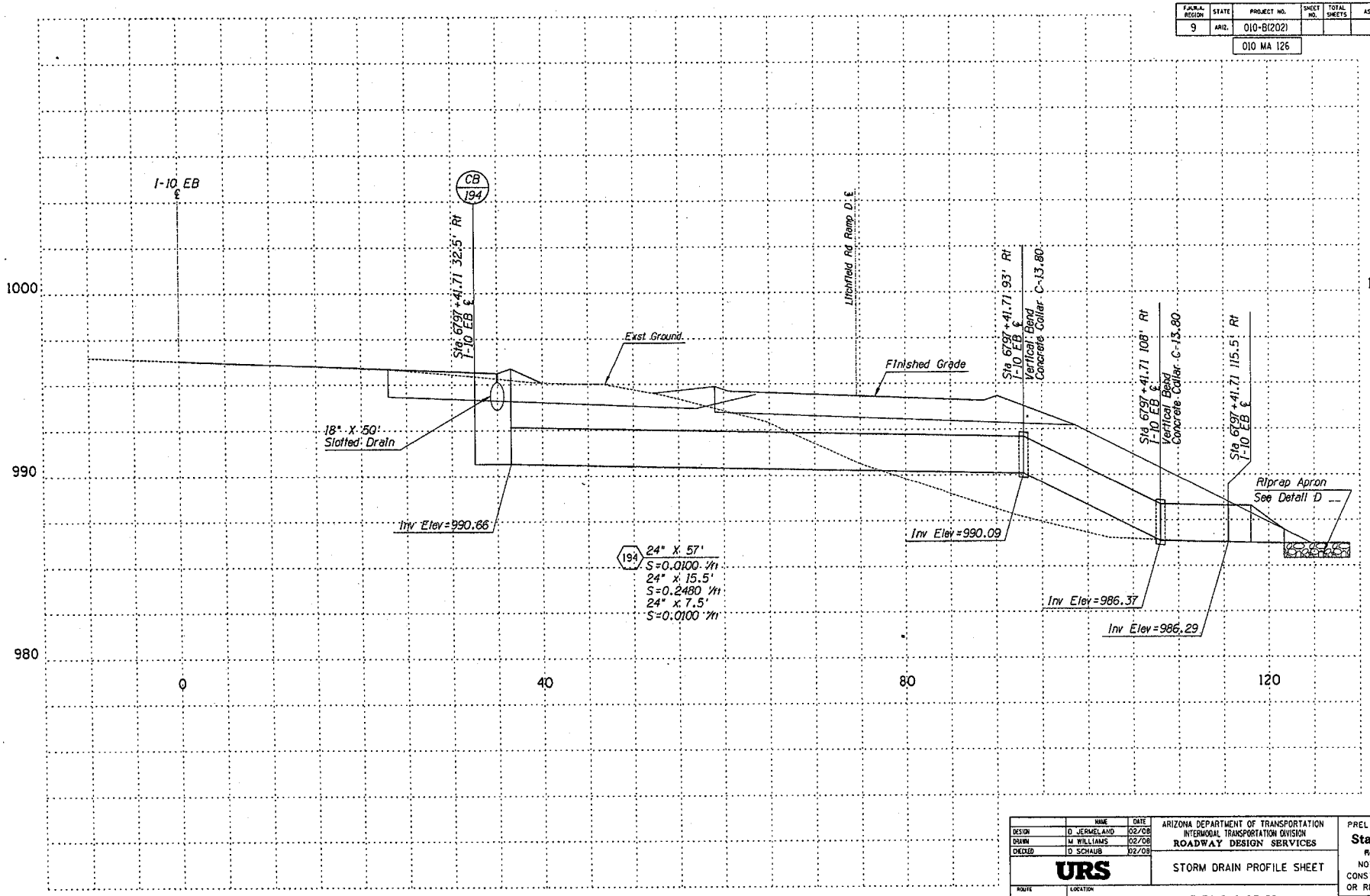
F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.33
TRACS NO. H7296 01C		010-B(202)

___ OF ___

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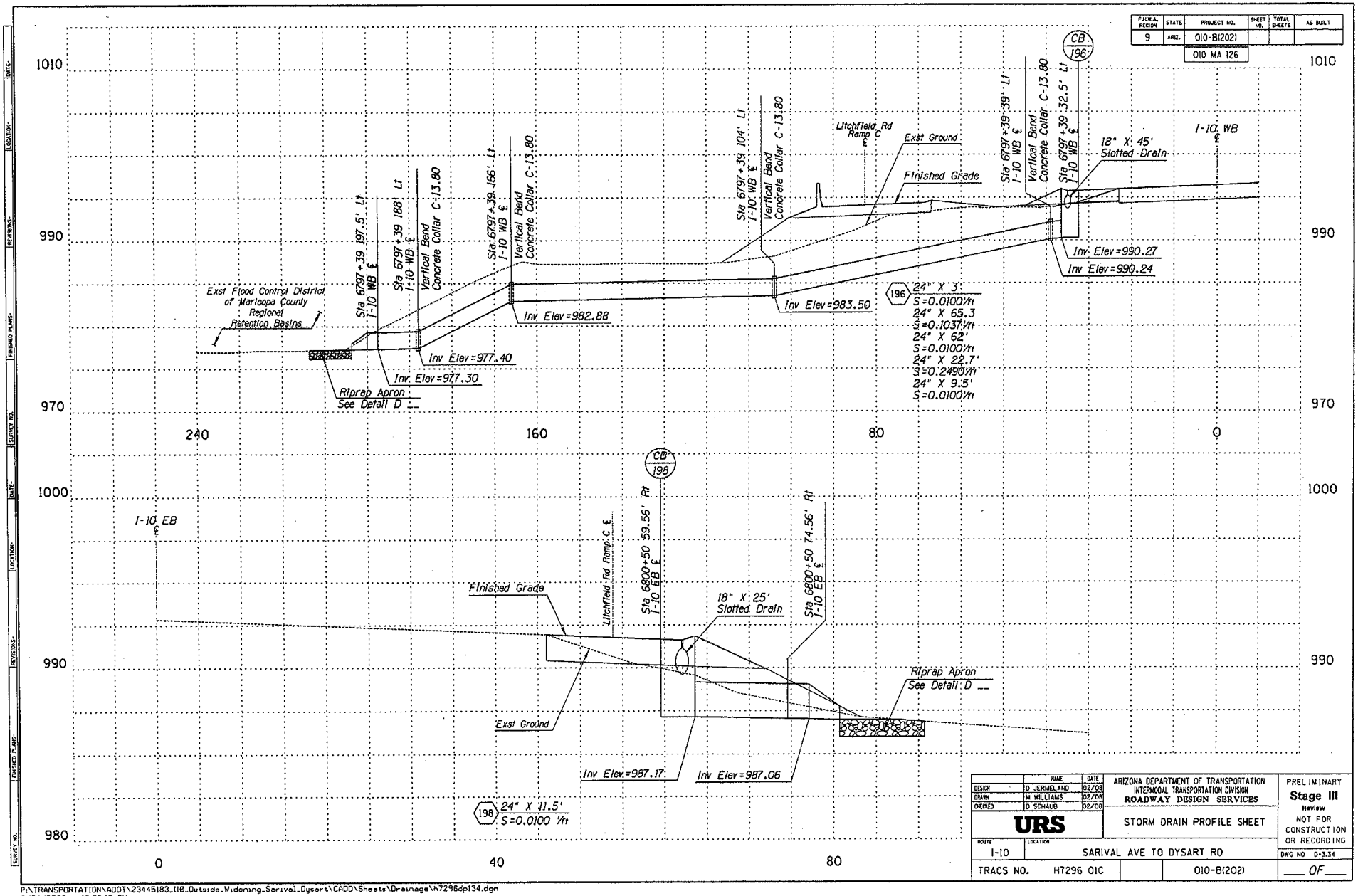

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.34

___ OF ___

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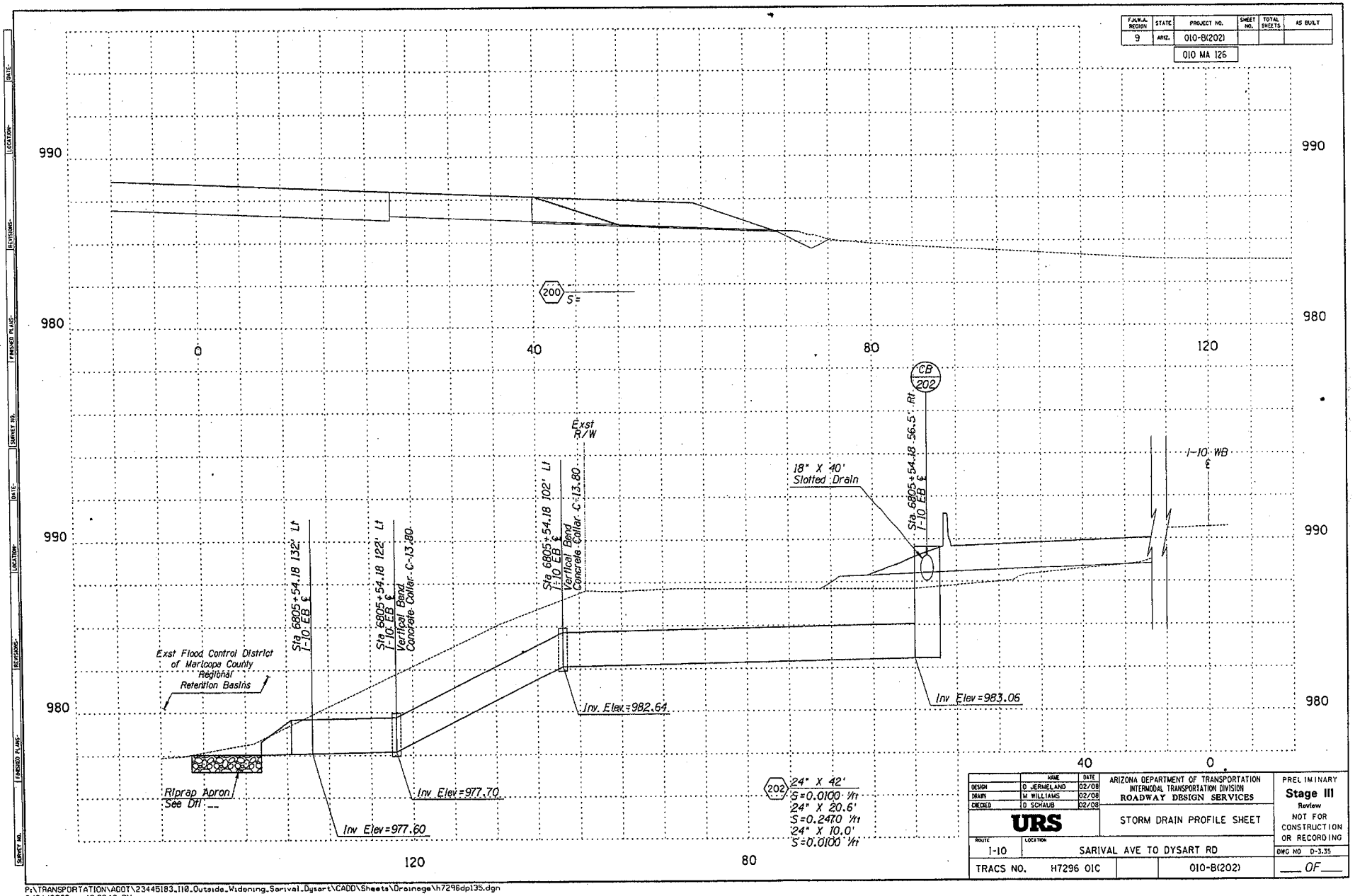

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.35

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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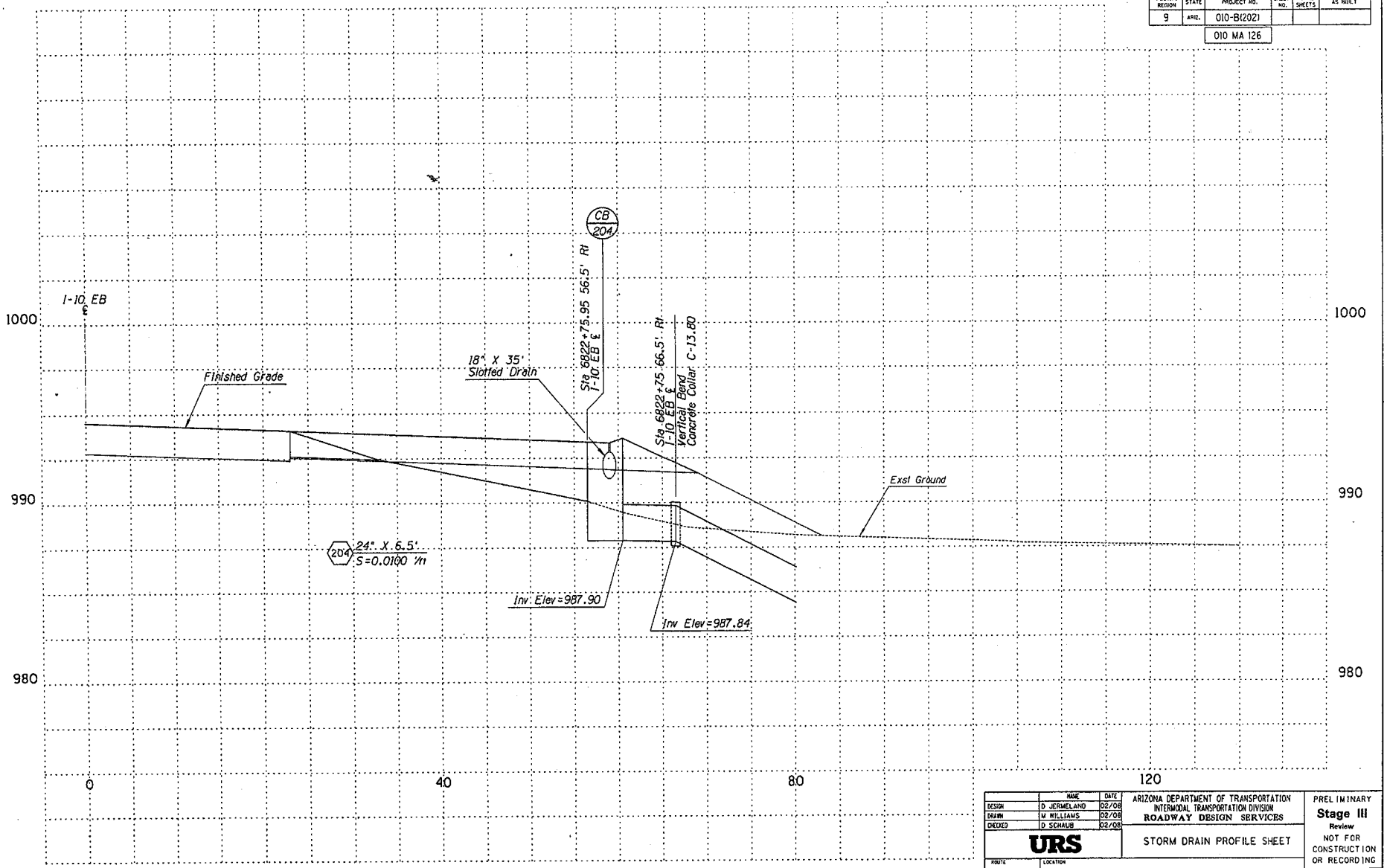

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO.		
H7296 01C		010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.36

___ OF ___

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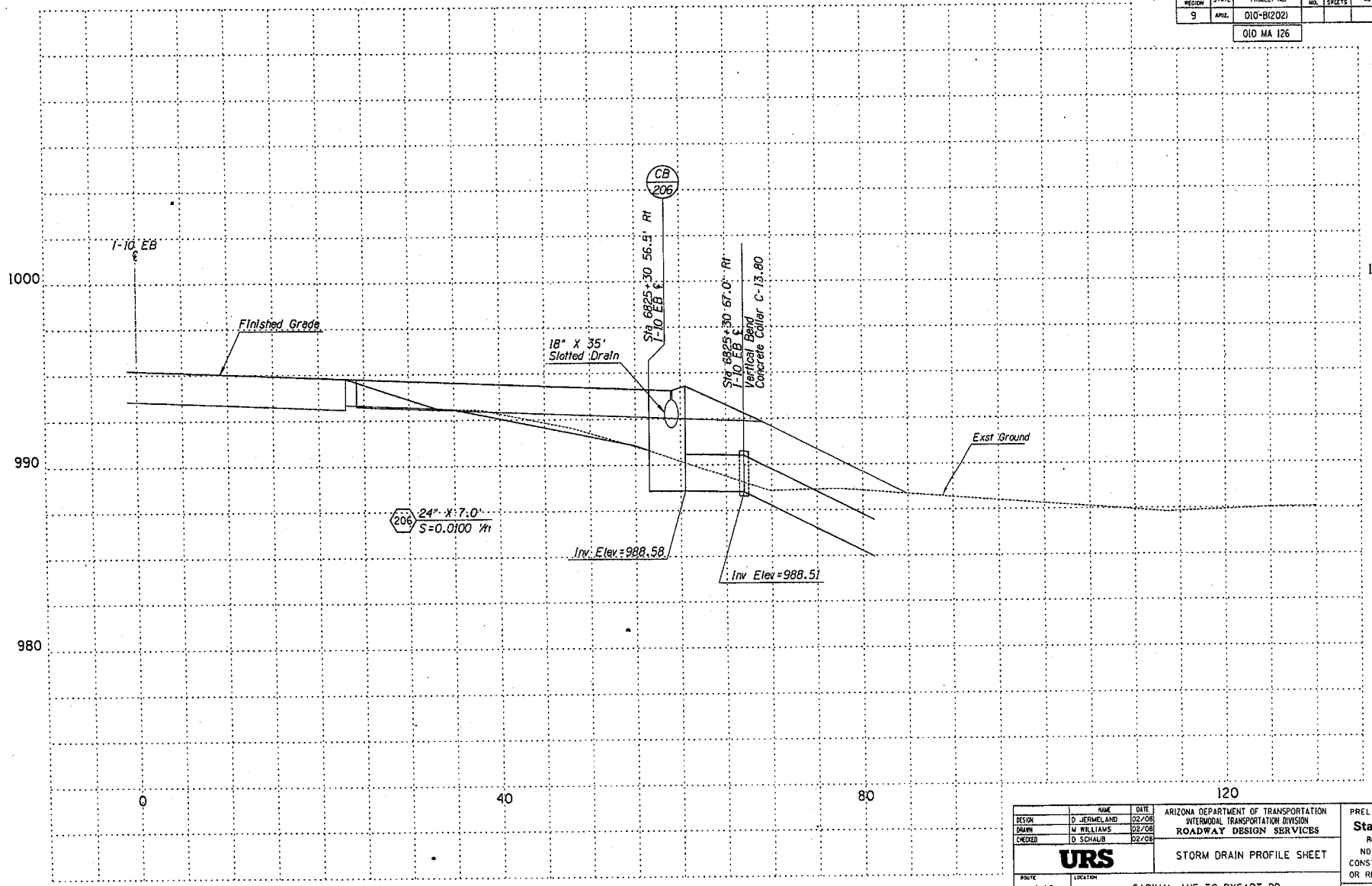
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.37

TRACS NO.			SHEET NO.
H7296 01C		010-B(202)	___ OF ___

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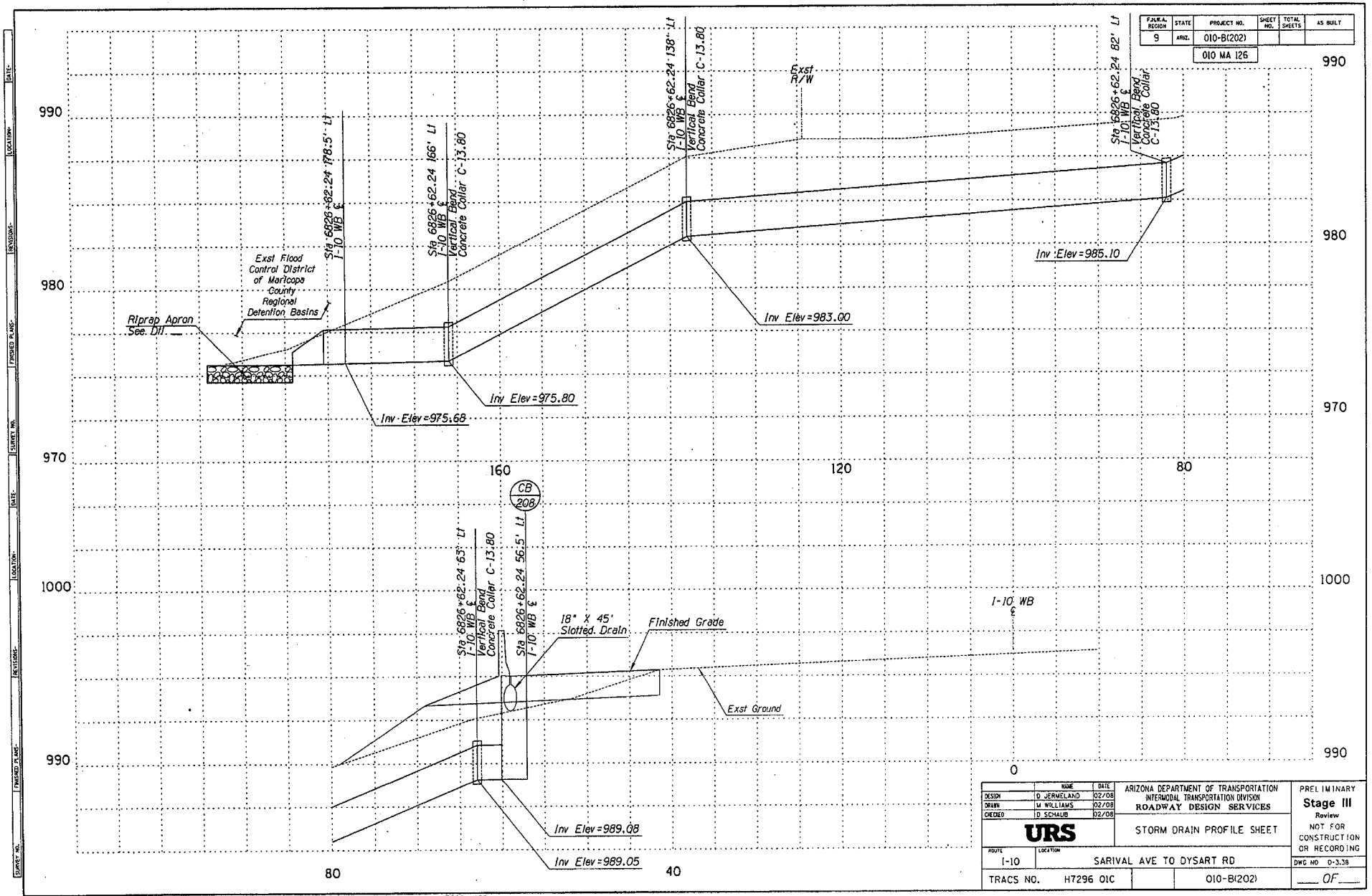

FAI/M.P. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.38

___ OF ___

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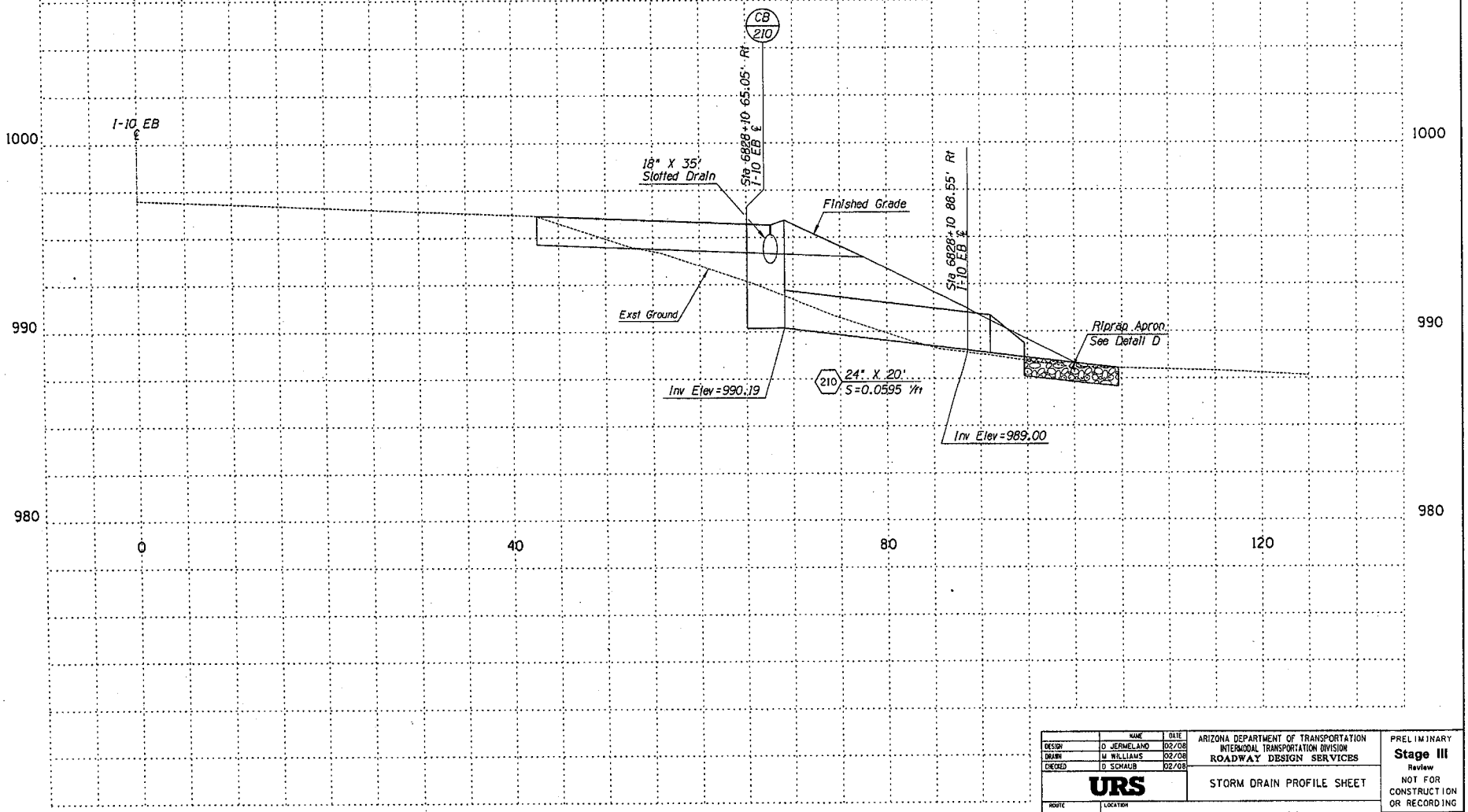
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.39

TRACS NO.			SHEET NO.
H7296 01C		010-B(202)	___ OF ___

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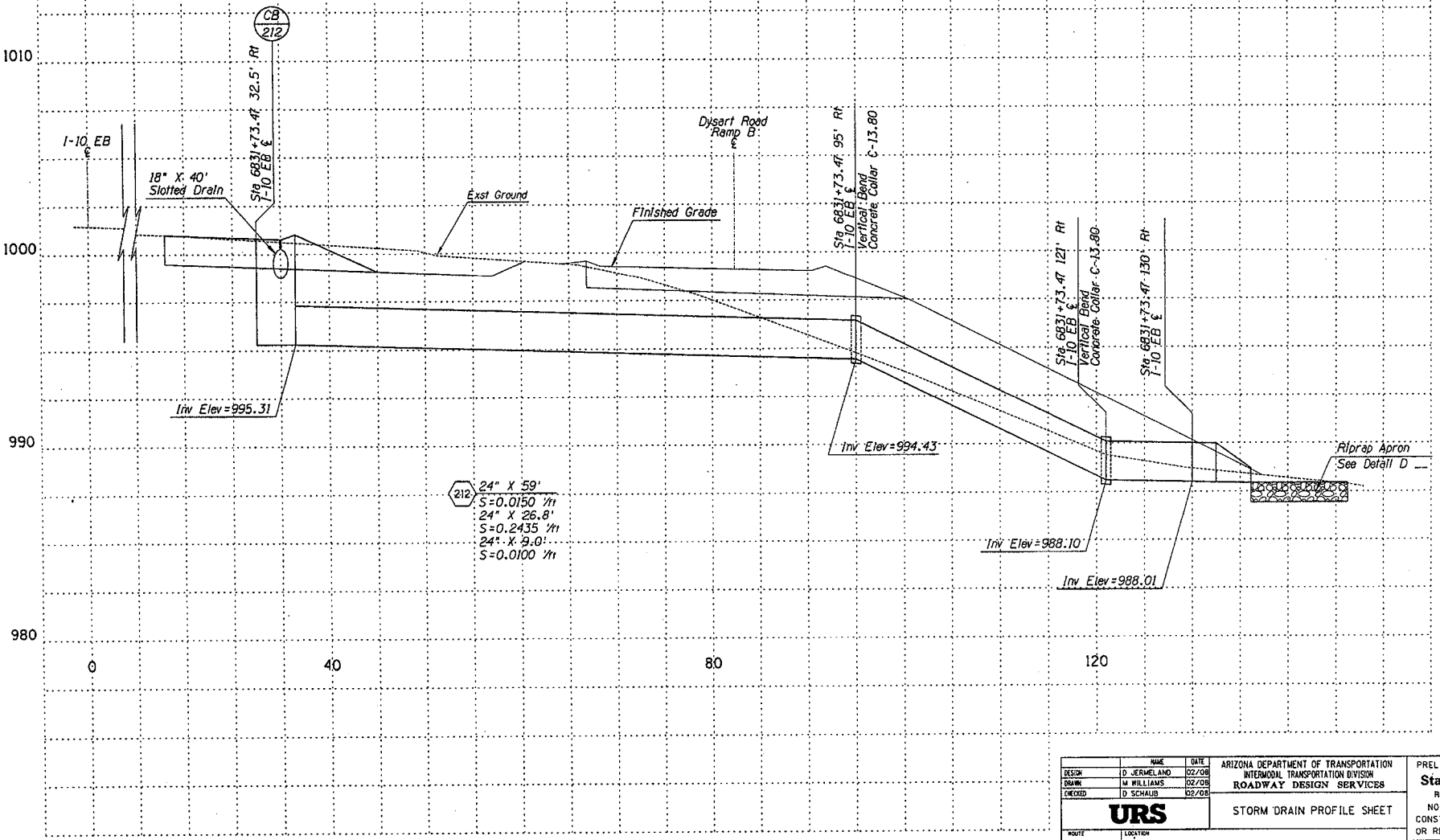

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.40
TRACS NO. H7296 01C	010-B(202)	___ OF ___

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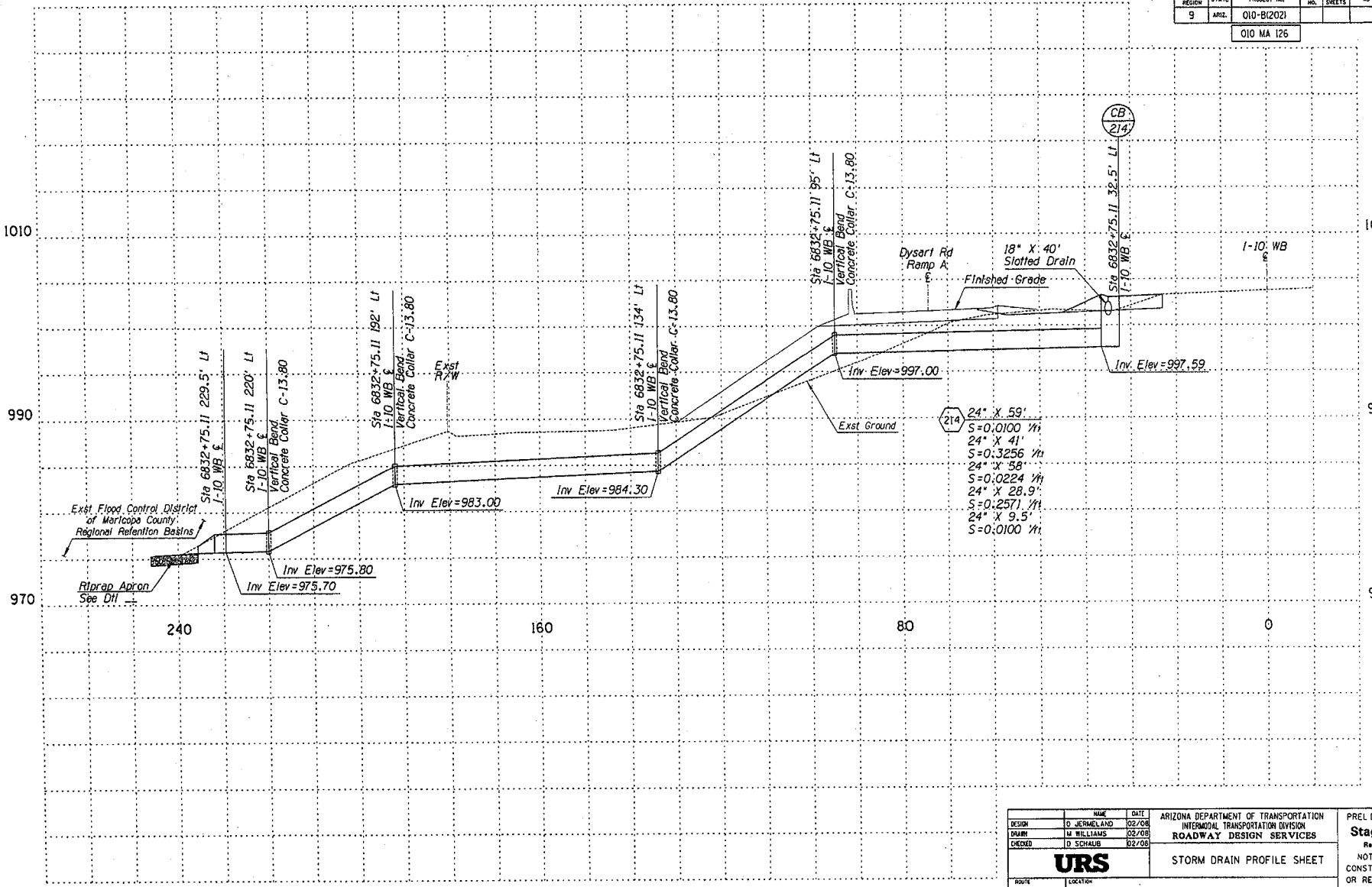
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 0-3.41

___ OF ___

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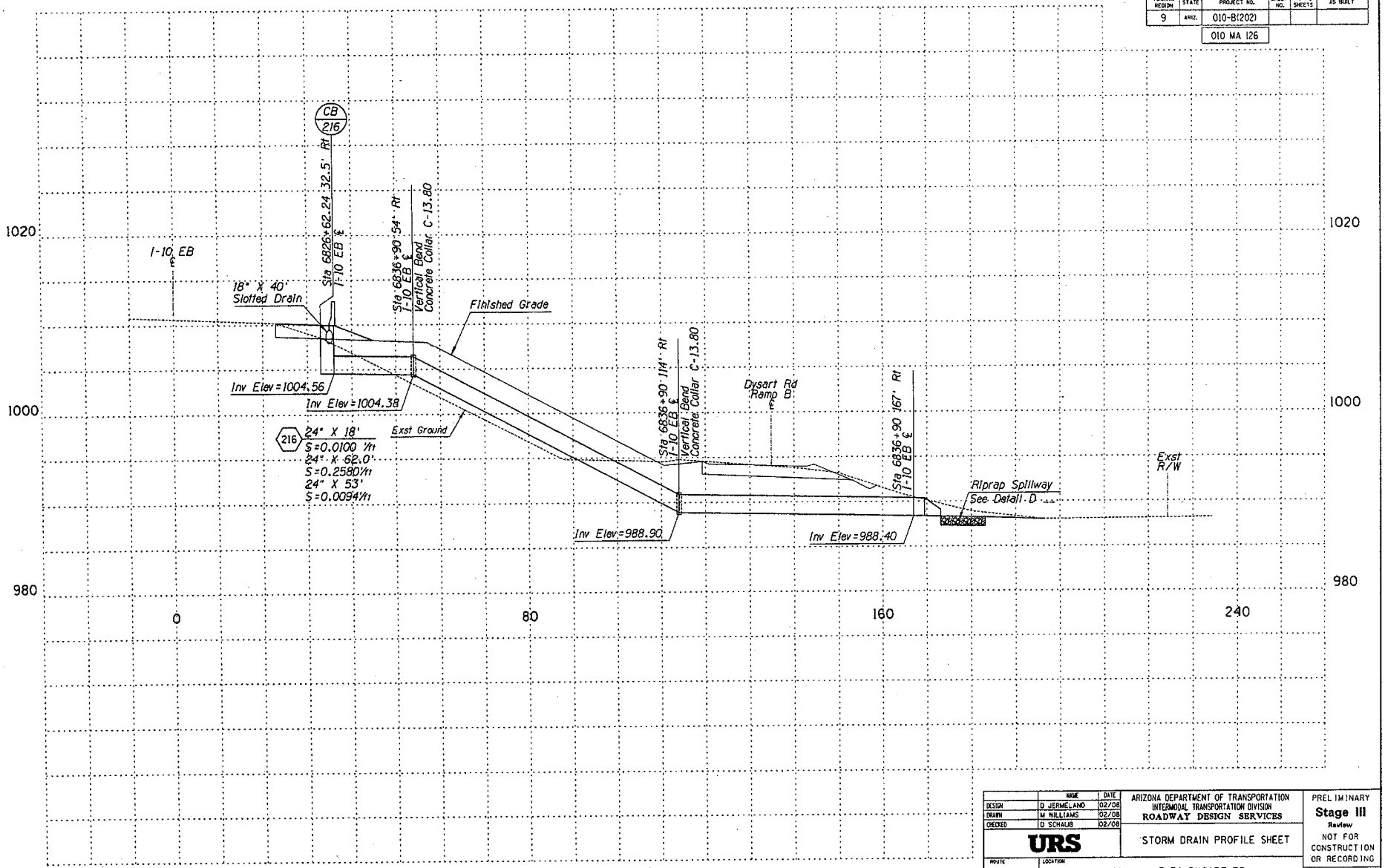

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.42

TRACS NO.			OF
H7296 01C		010-B(202)	

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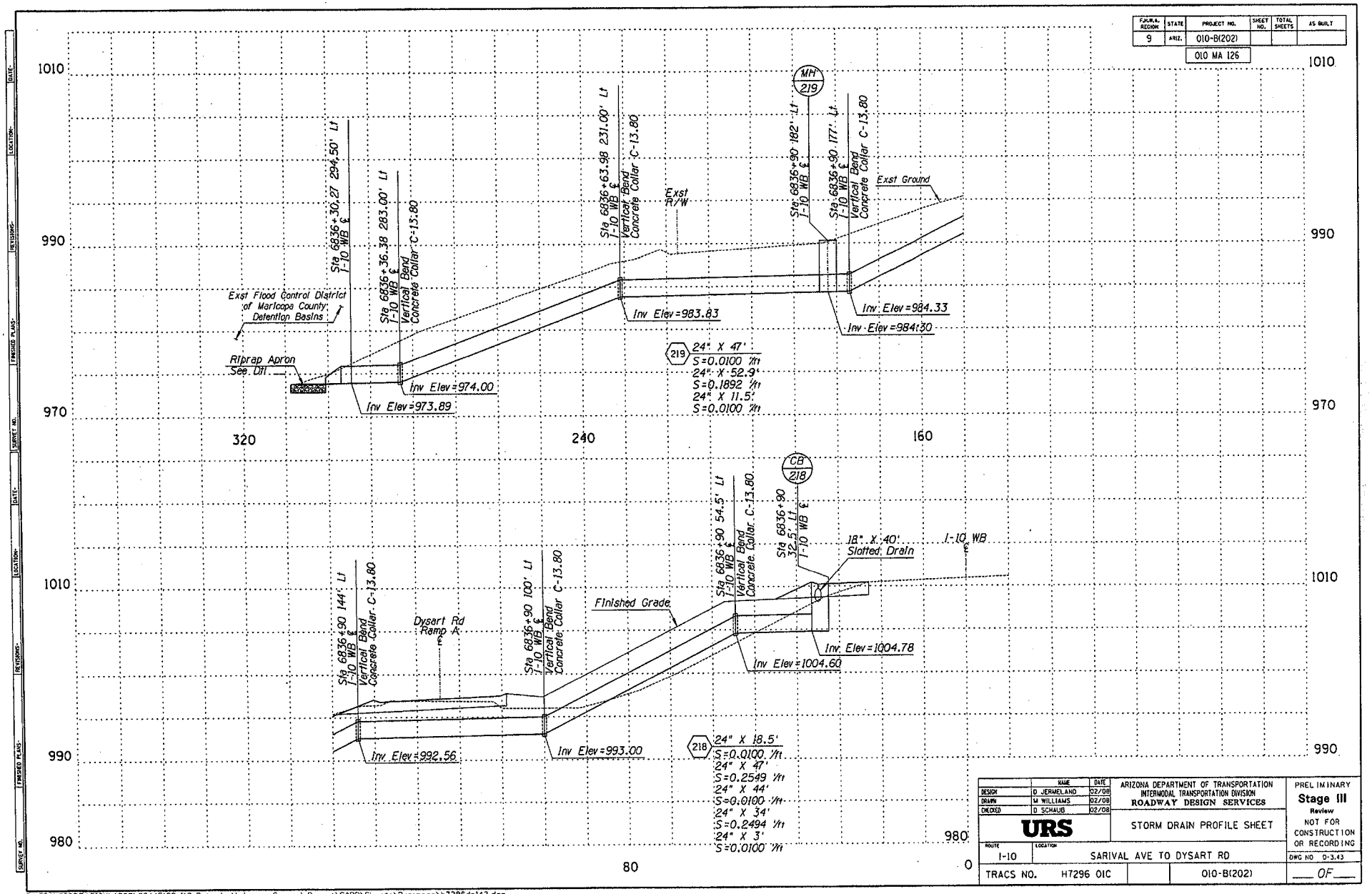

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-3.43

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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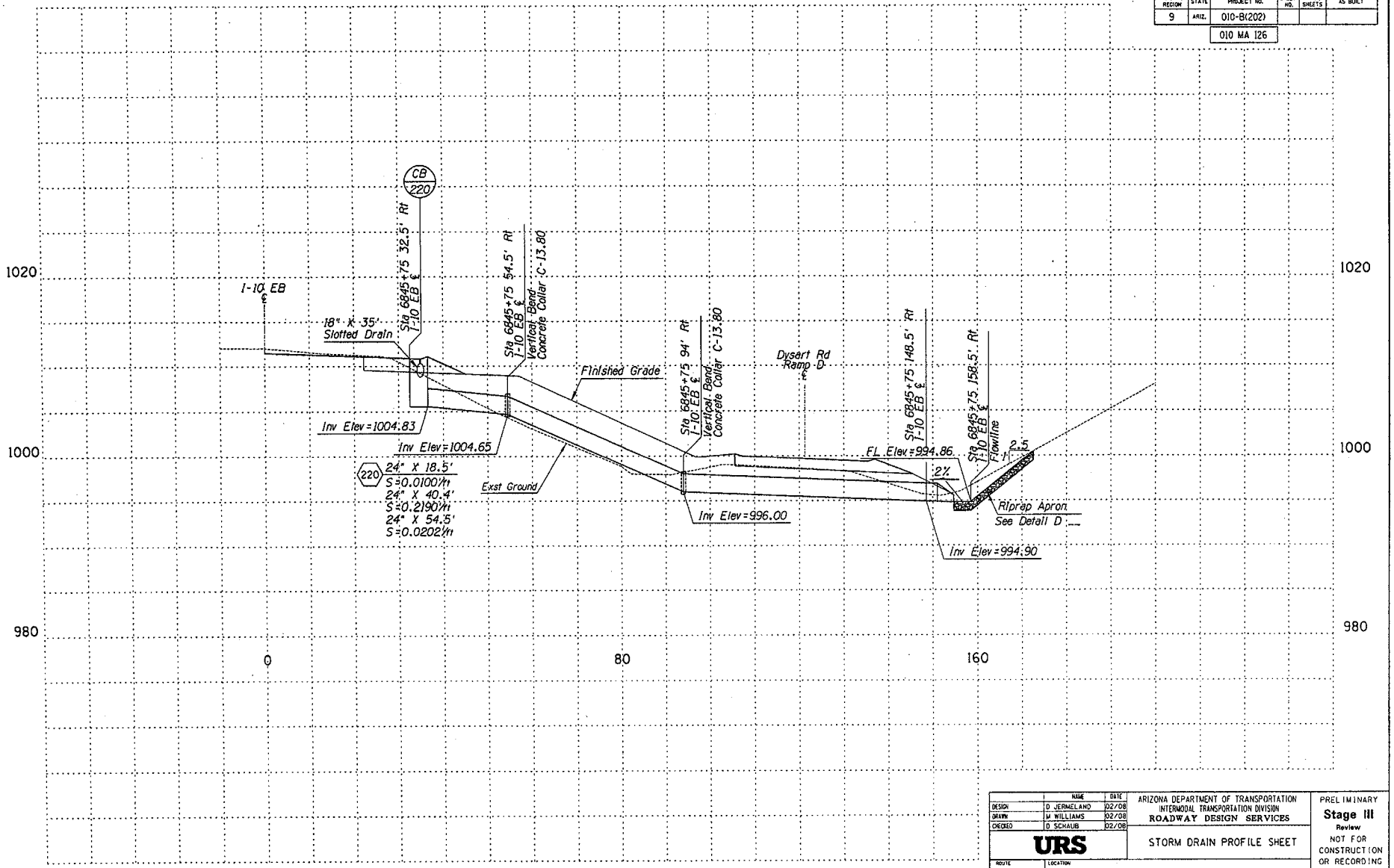

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION	
I-10	SARIVAL AVE TO DYSART RD	
TRACS NO. H7296 01C		010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.44

___ OF ___

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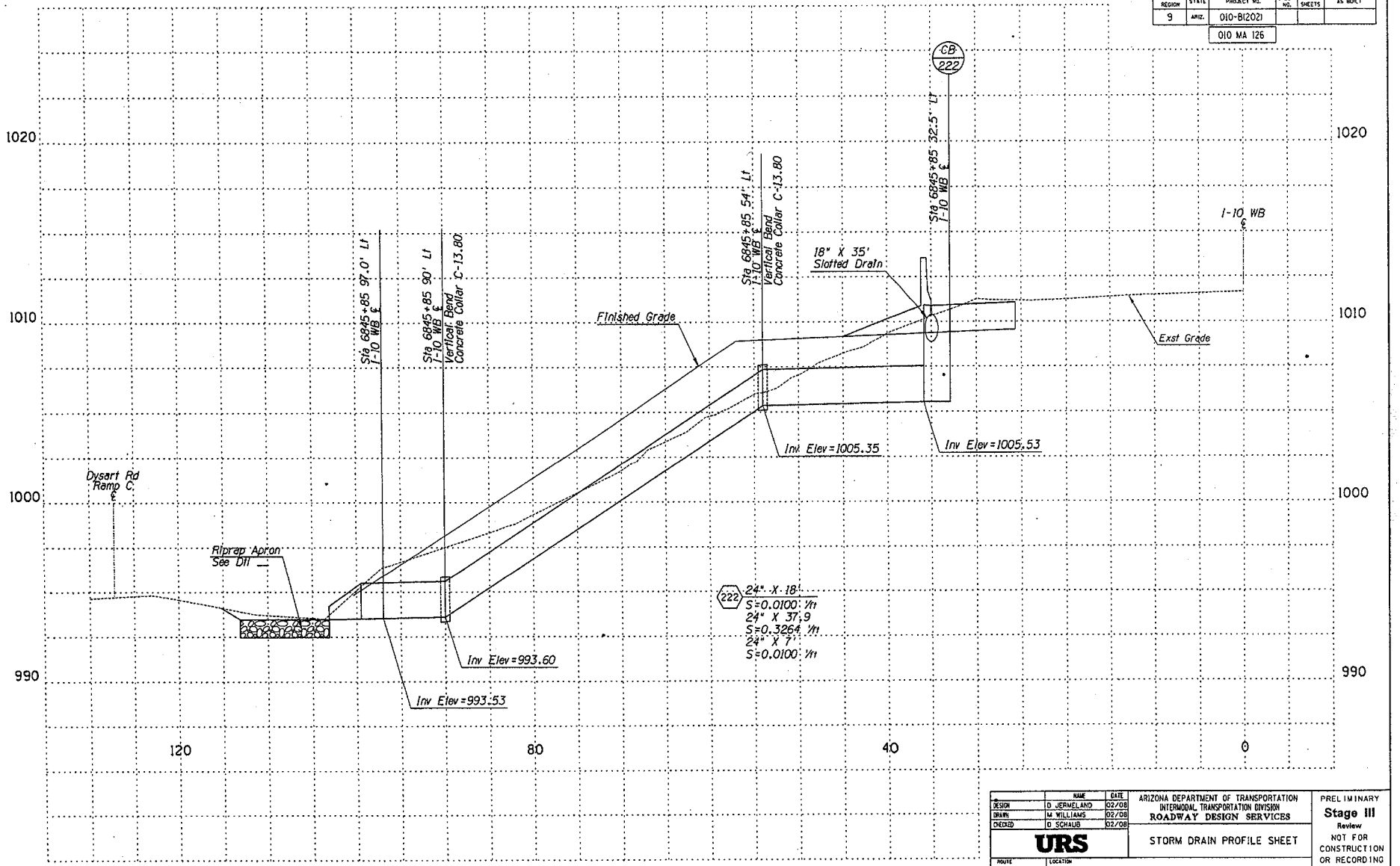
F.A.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-3.45

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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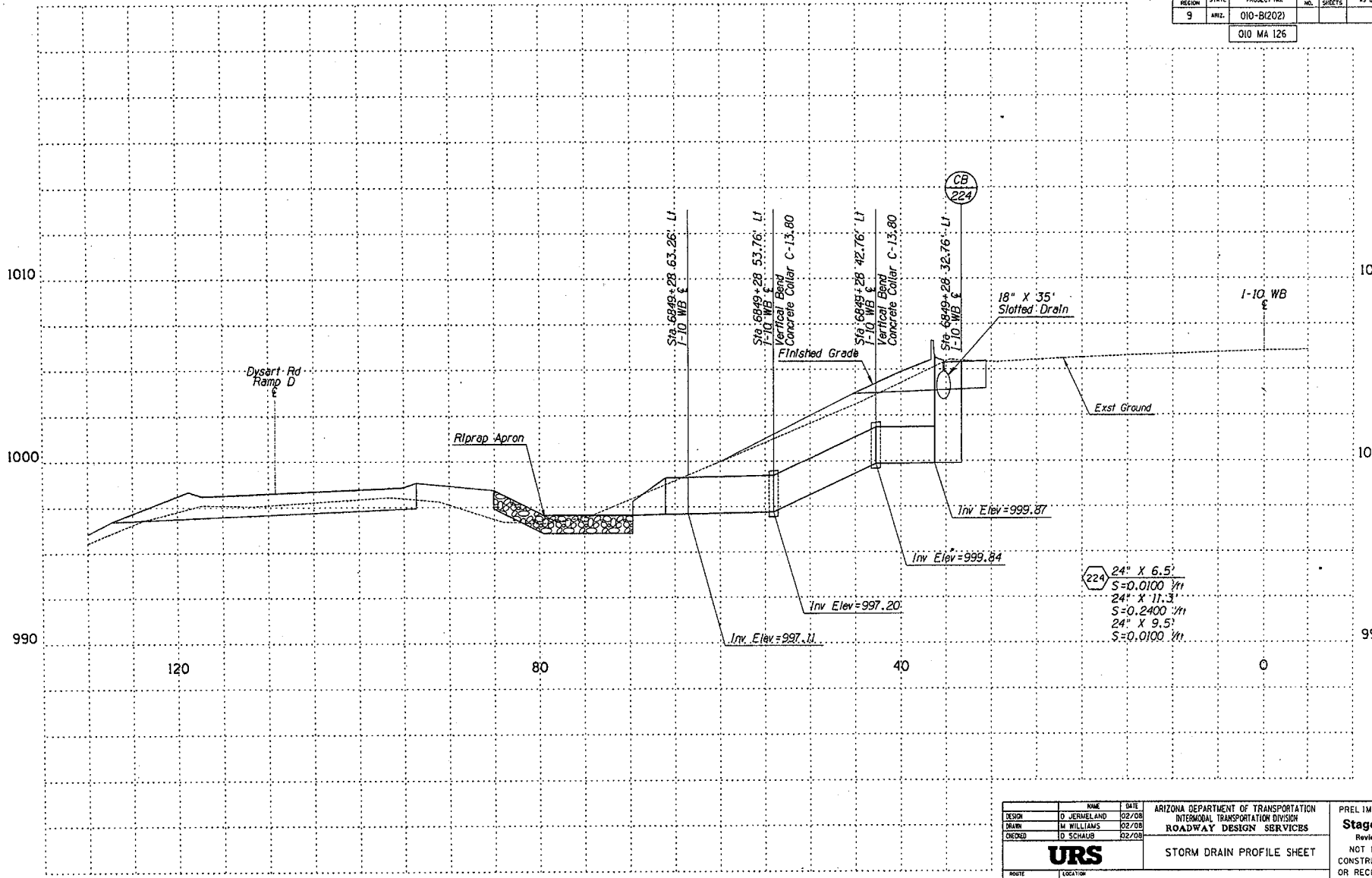
F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		DWG NO D-3.46
TRACS NO.	H7296 01C	010-B(202)	___ OF ___

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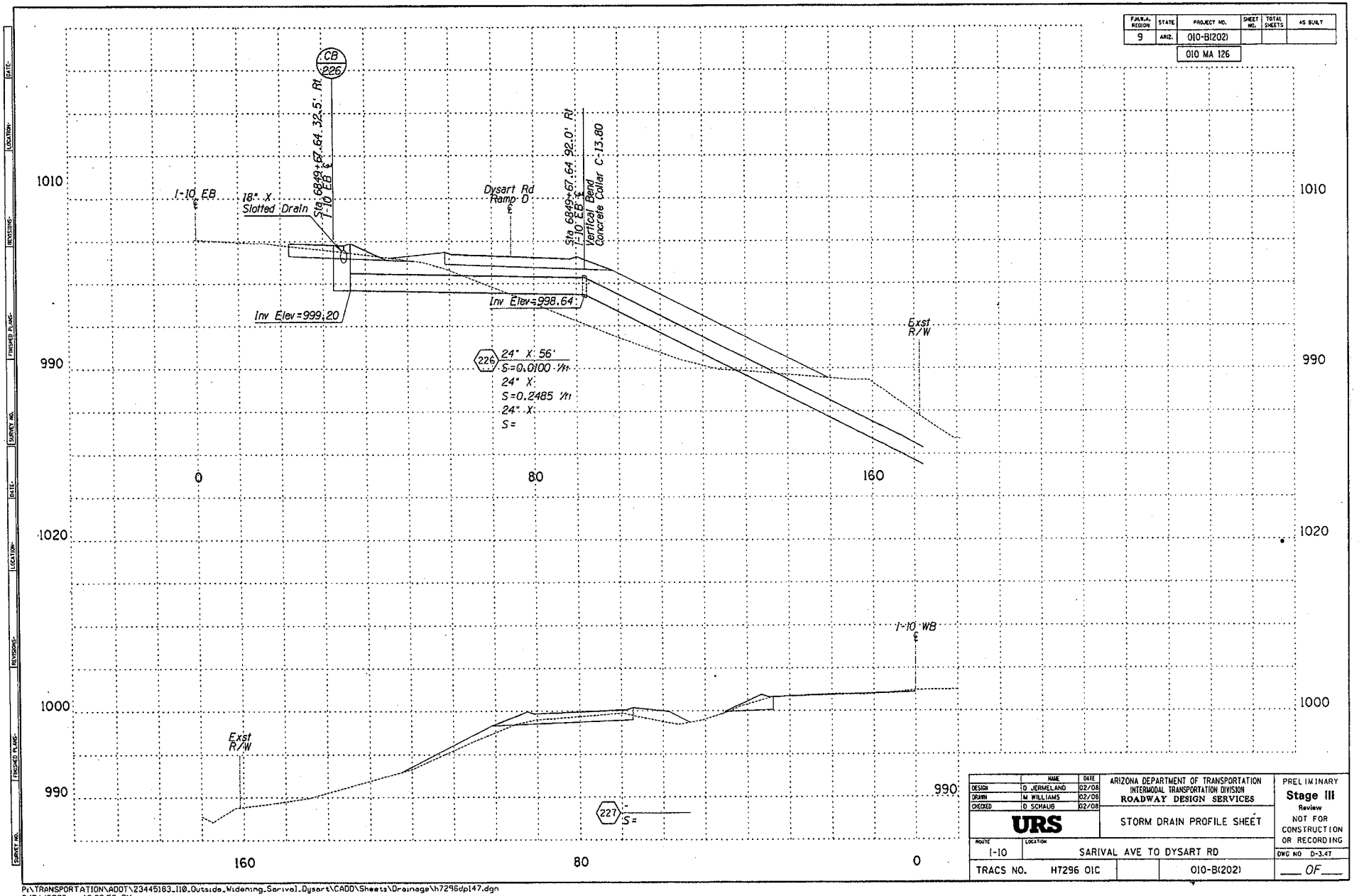
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		
TRACS NO.	H7296 01C		010-B(202)

DWG NO D-3.47

___ OF ___

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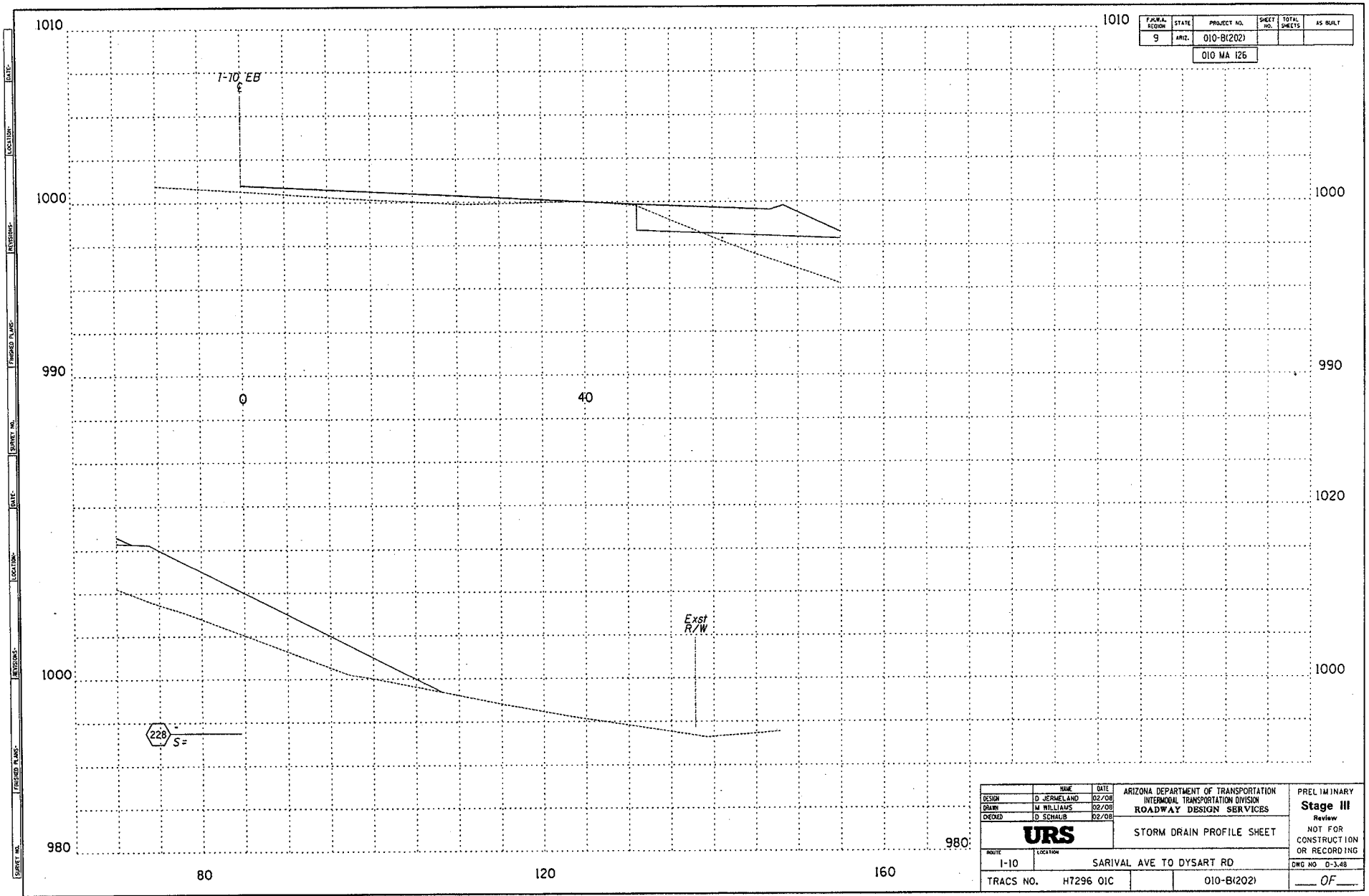

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.48

___ OF ___

DATE: | LOCATION: | REVISIONS: | FINISHED PLANS: | SURVEY NO.: | DATE: | LOCATION: | REVISIONS: | FINISHED PLANS: | SURVEY NO.:

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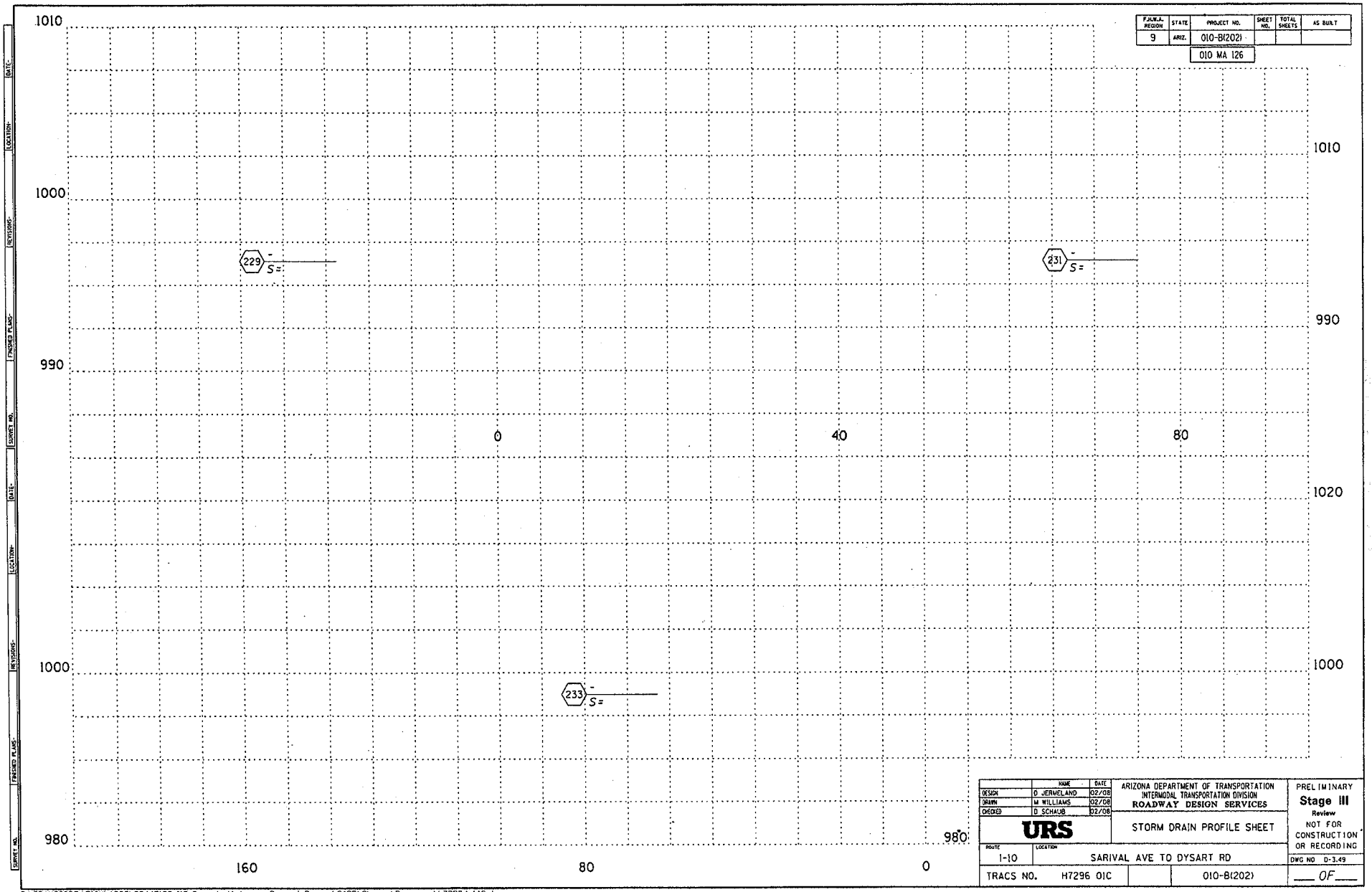

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO.		
H7296 01C		010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.49

___ OF ___

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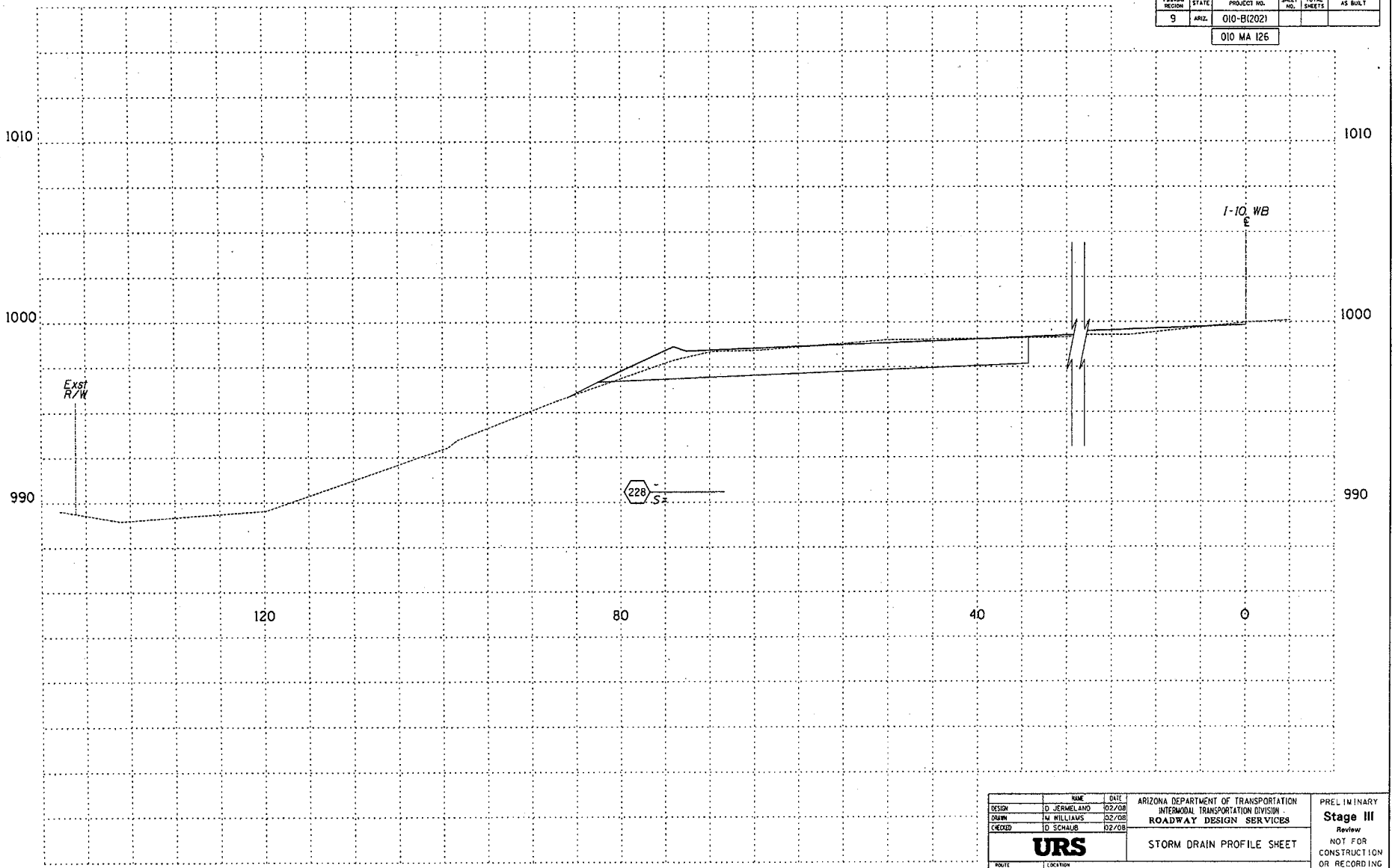
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAMO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	0-3.50

TRACS NO.			SHEET NO.
H7296 01C		010-B(202)	___ OF ___

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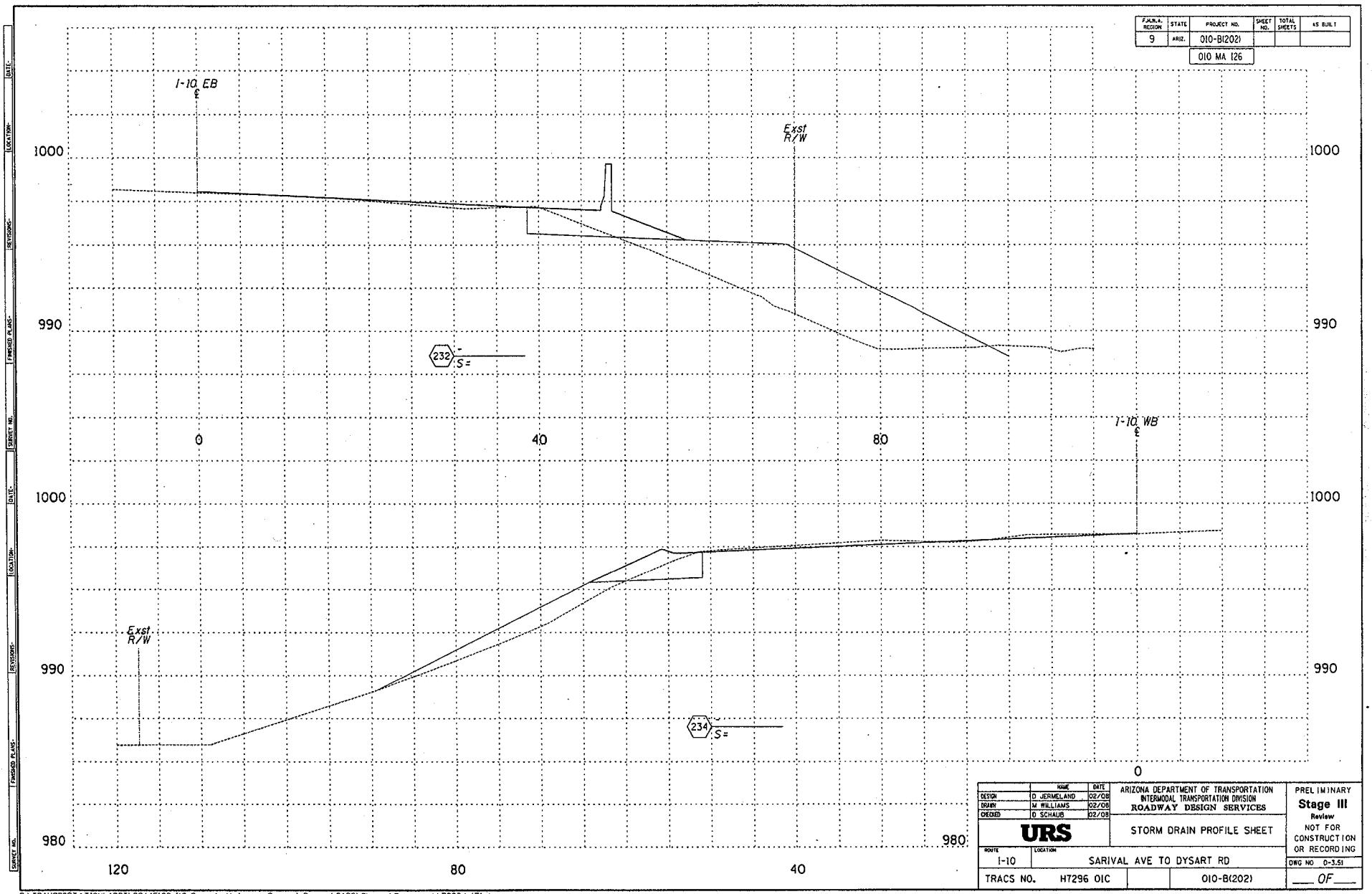

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 0-3.51

___ OF ___

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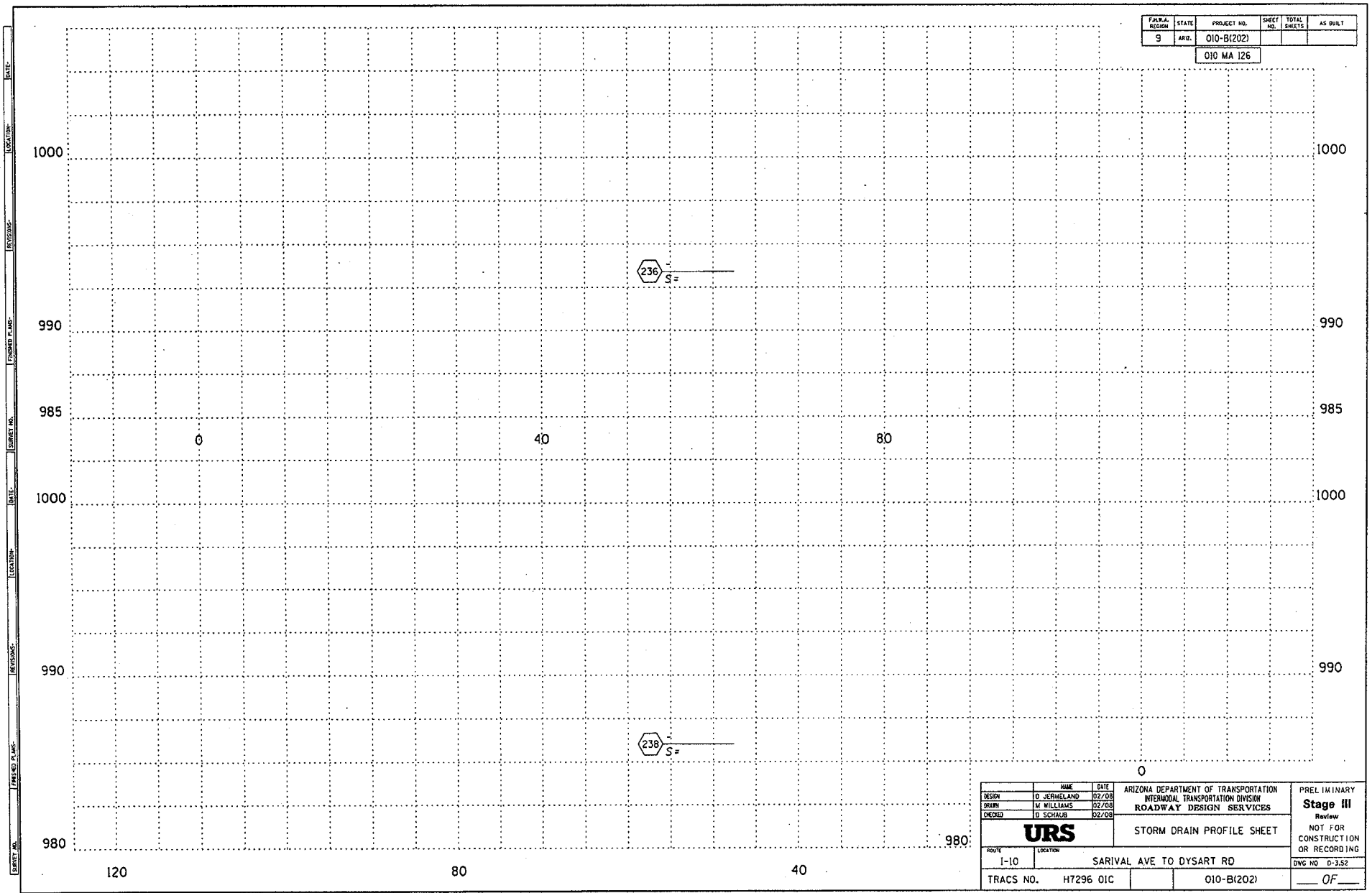

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.52

___ OF ___

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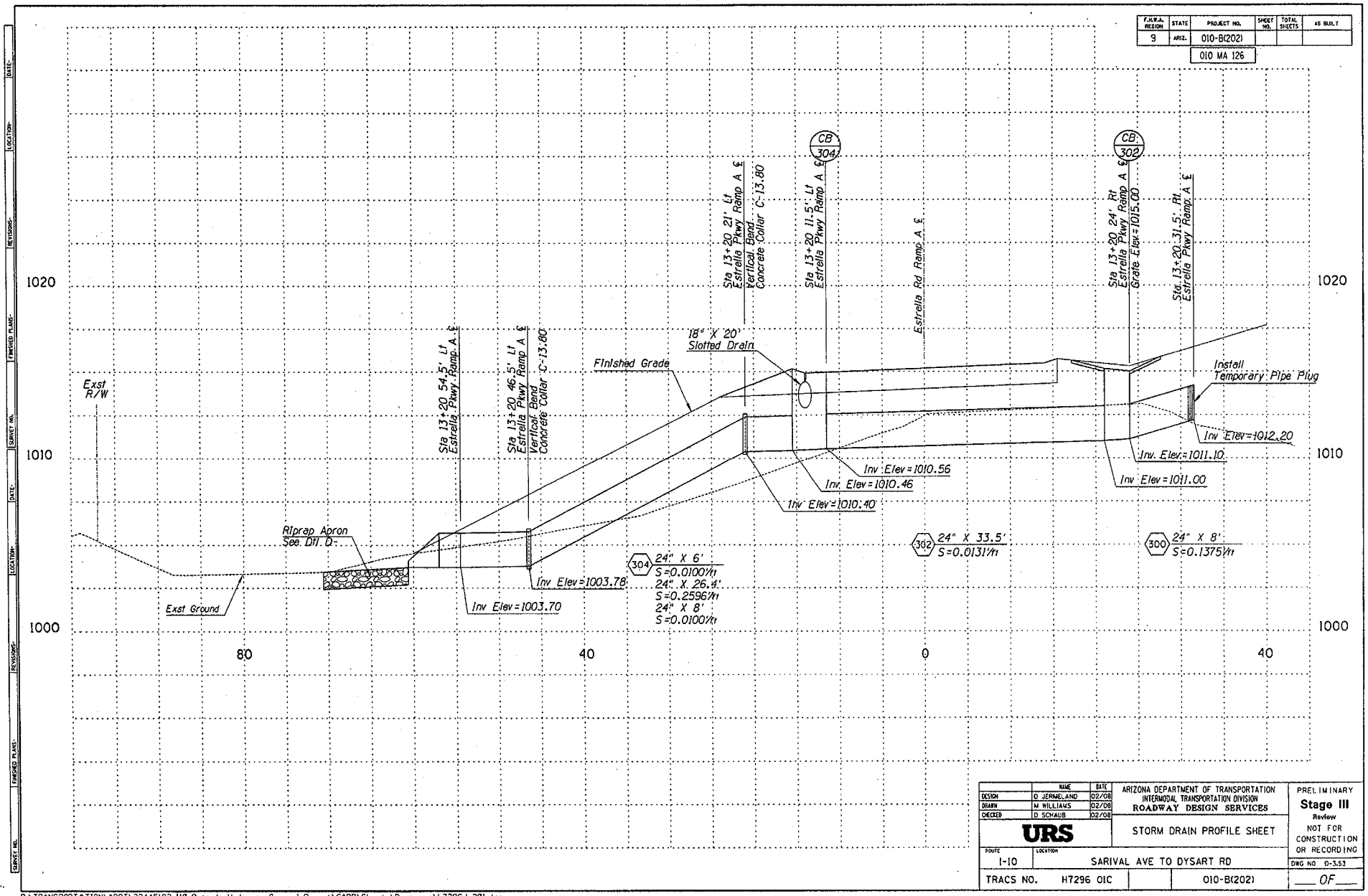

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.53

___ OF ___

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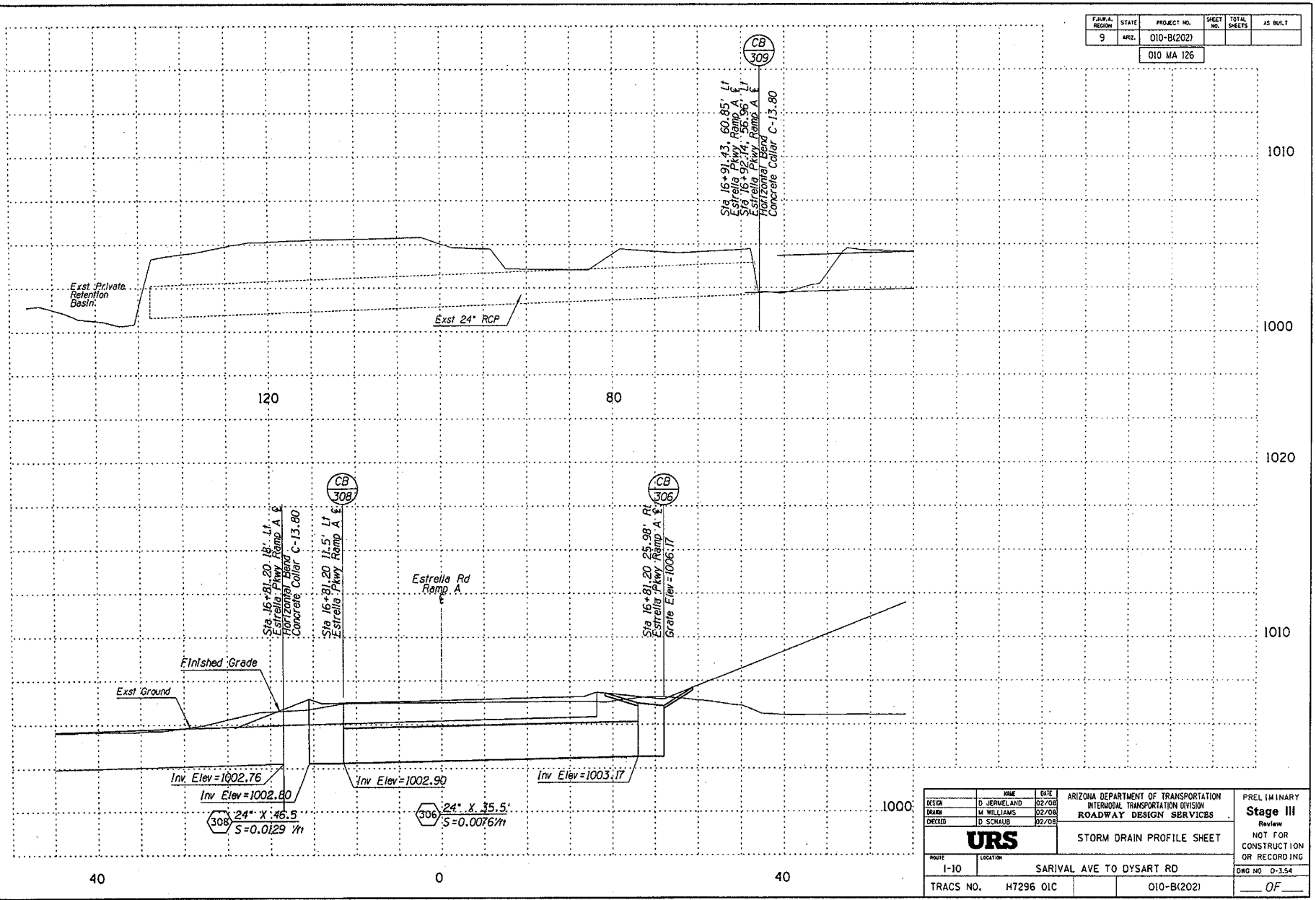

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO.
I-10	SARIVAL AVE TO DYSART RD	D-3.54

TRACS NO.			
H7296 01C		010-B(202)	___ OF ___

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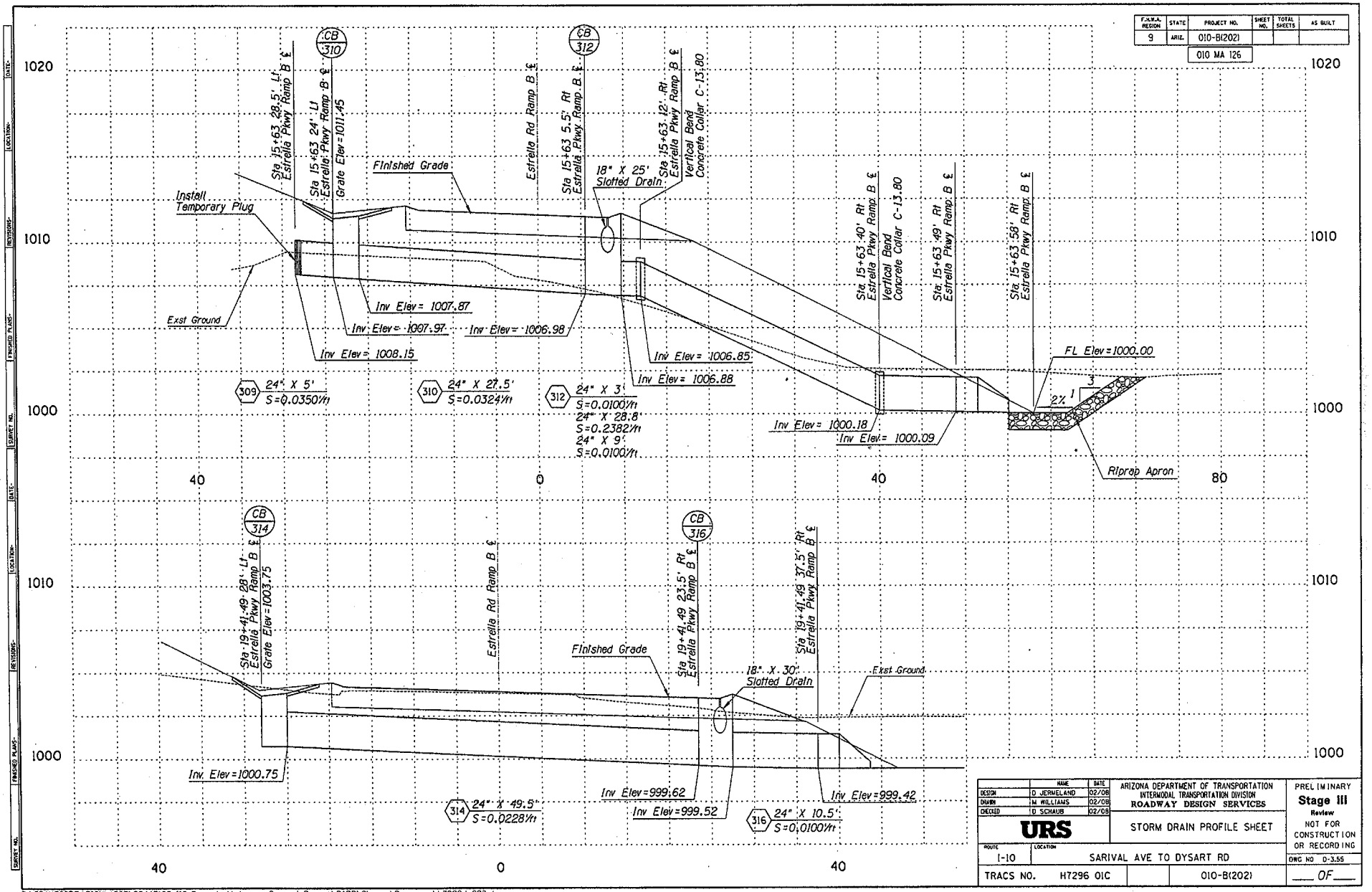

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.55

___ OF ___

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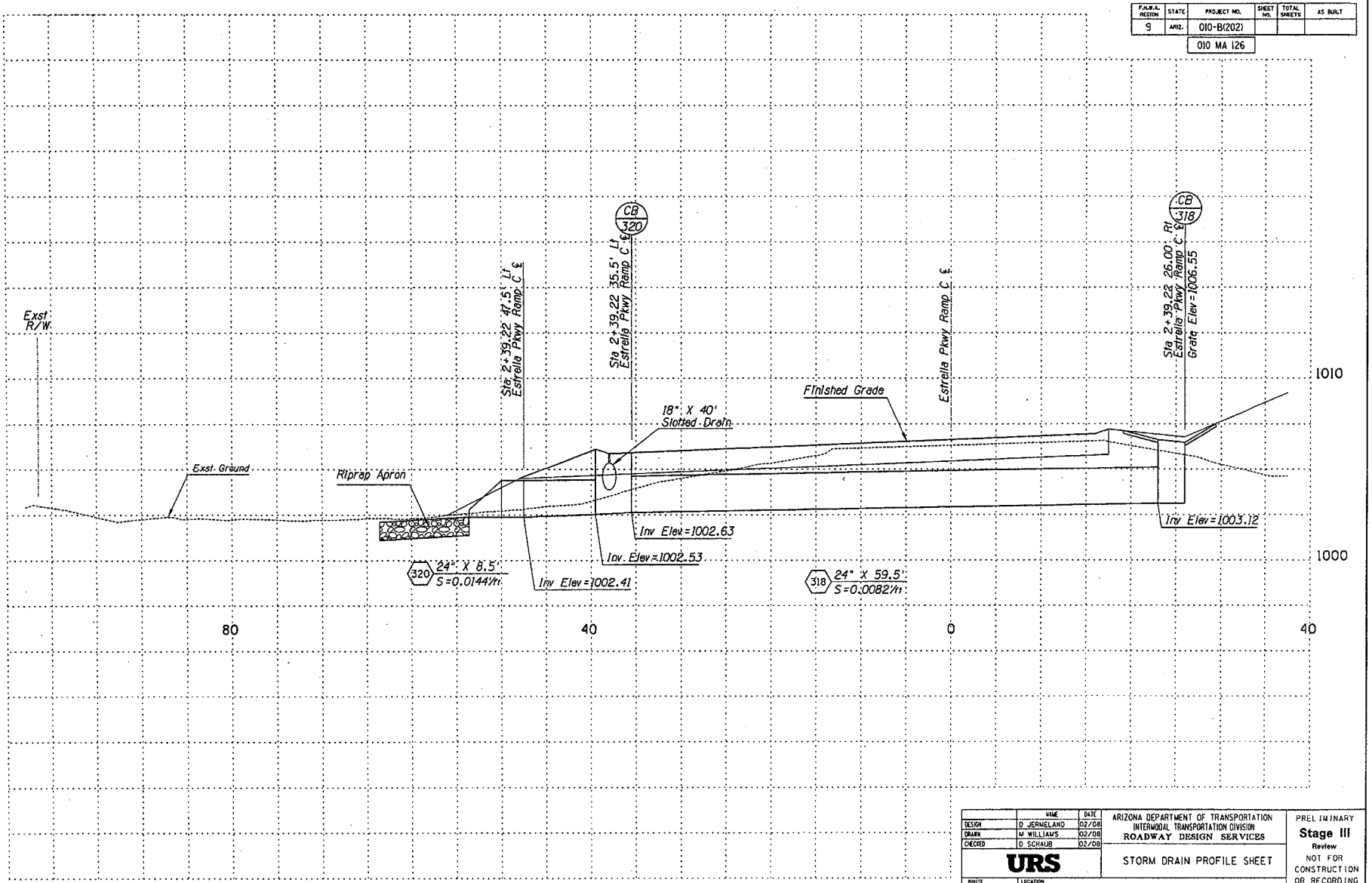

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		DWG NO. D-3.56
TRACS NO. H7296 01C		010-B(202)	___ OF ___

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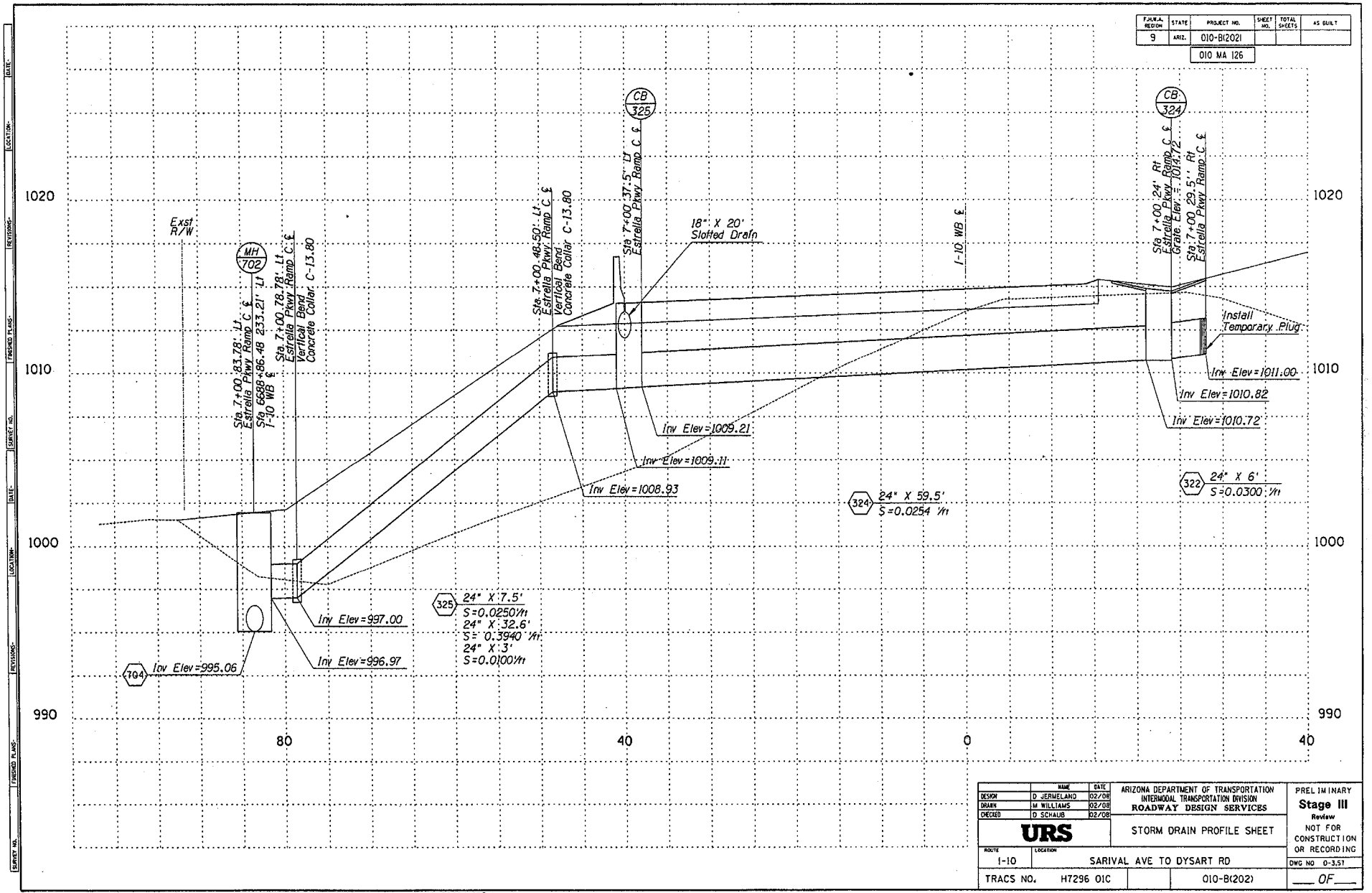

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)I			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.57

___ OF ___

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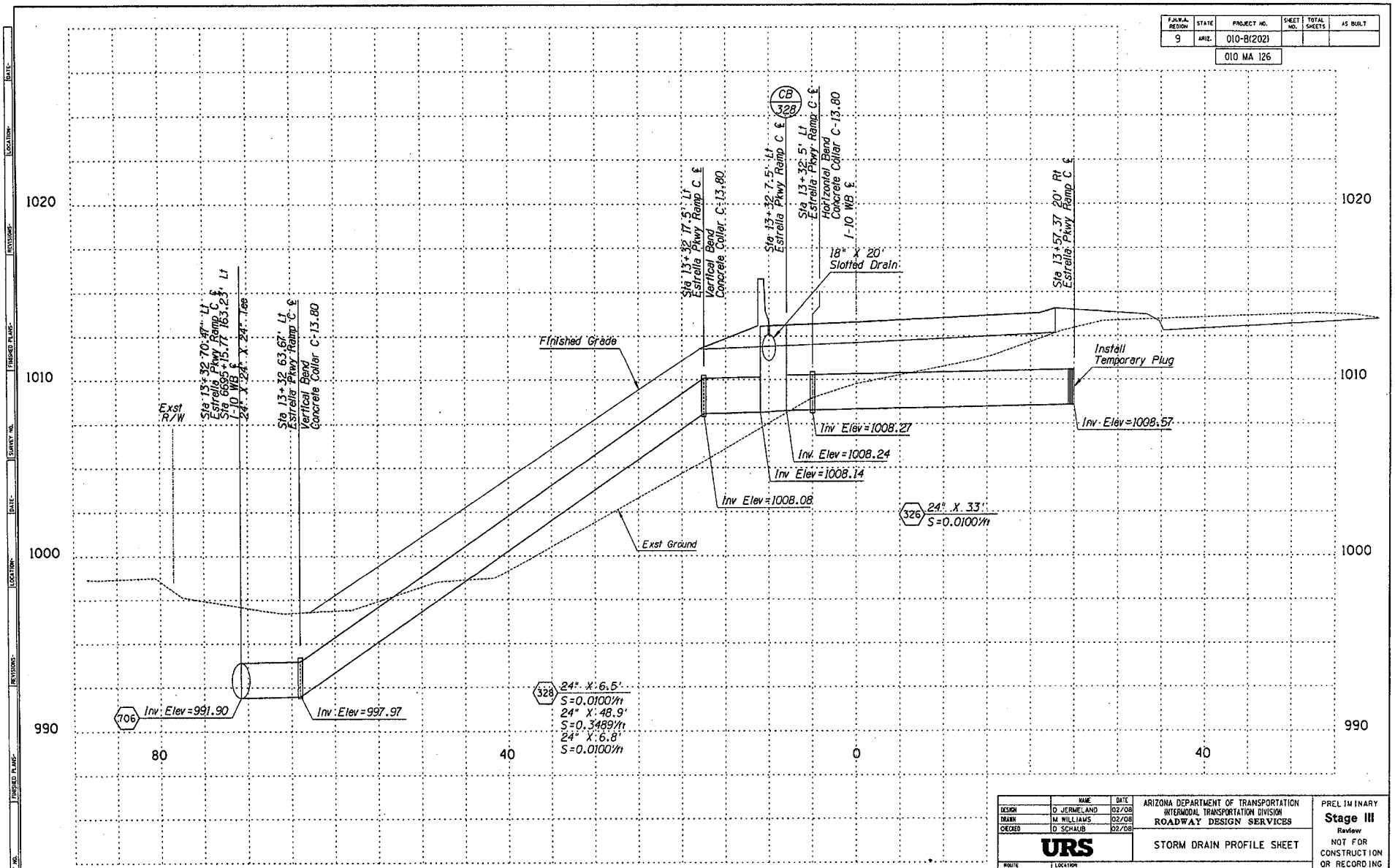

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.58

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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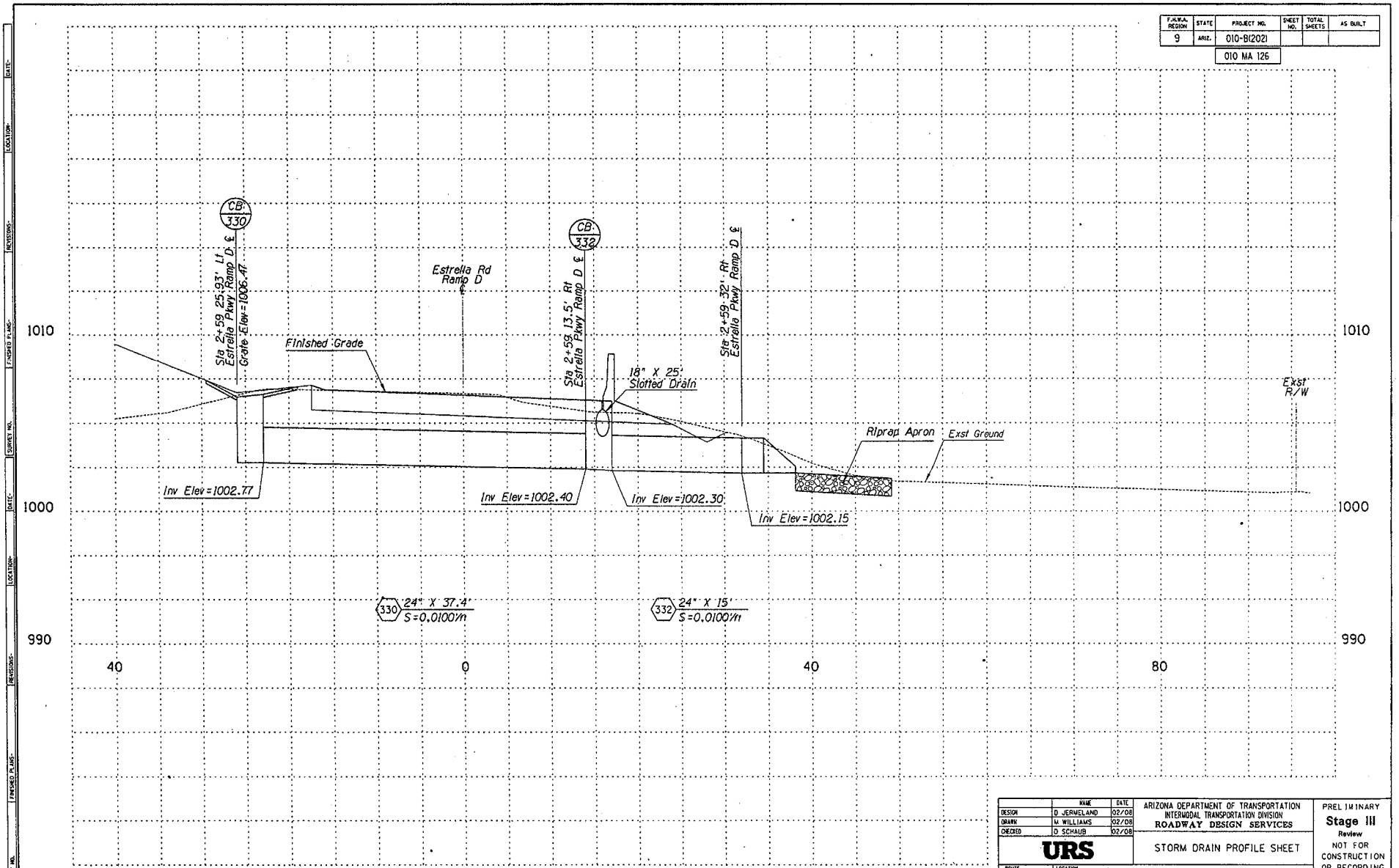
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.59

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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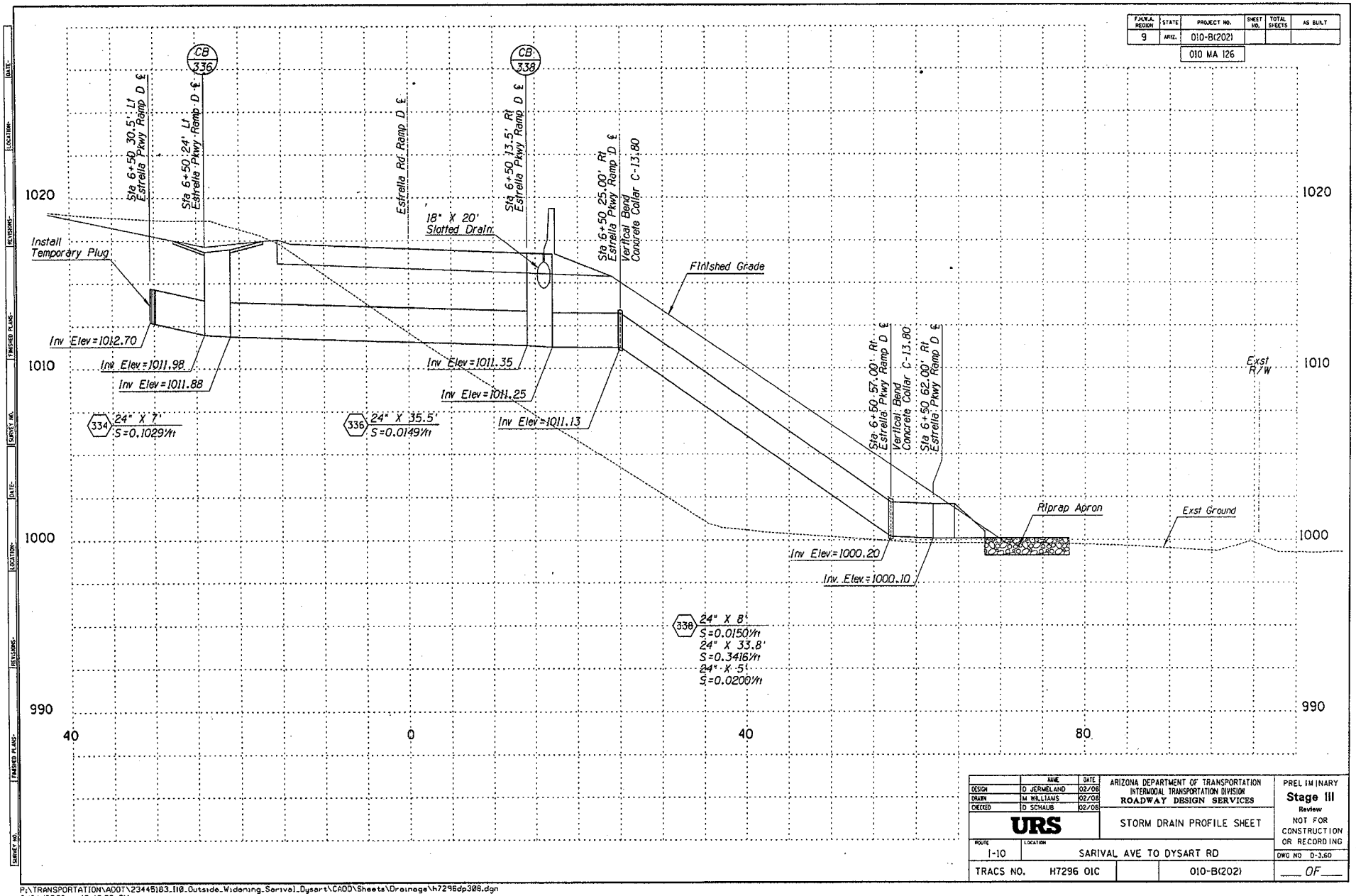

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE: I-10 | LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.60

___ OF ___

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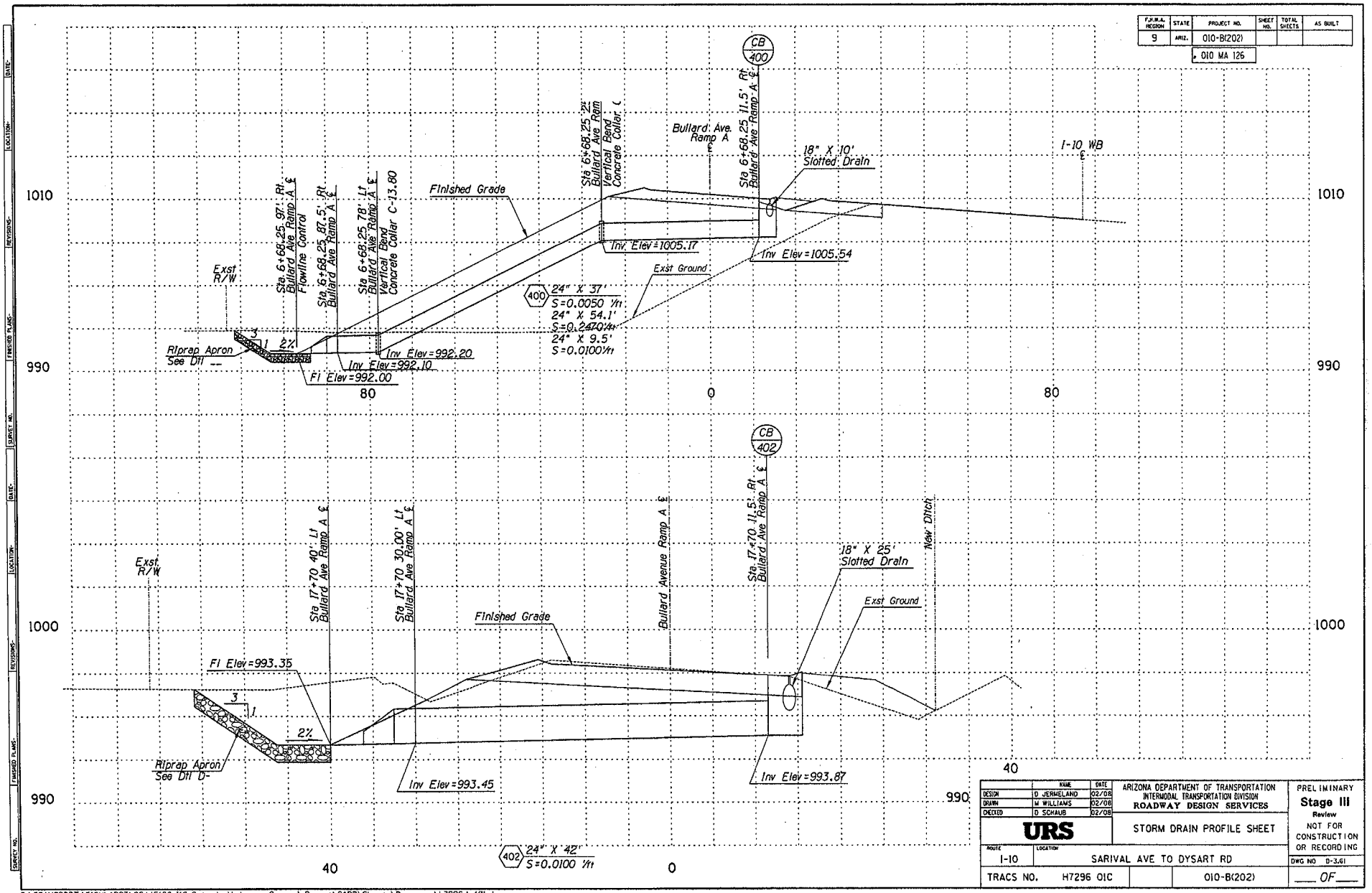

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		▸ 010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.61

___ OF ___

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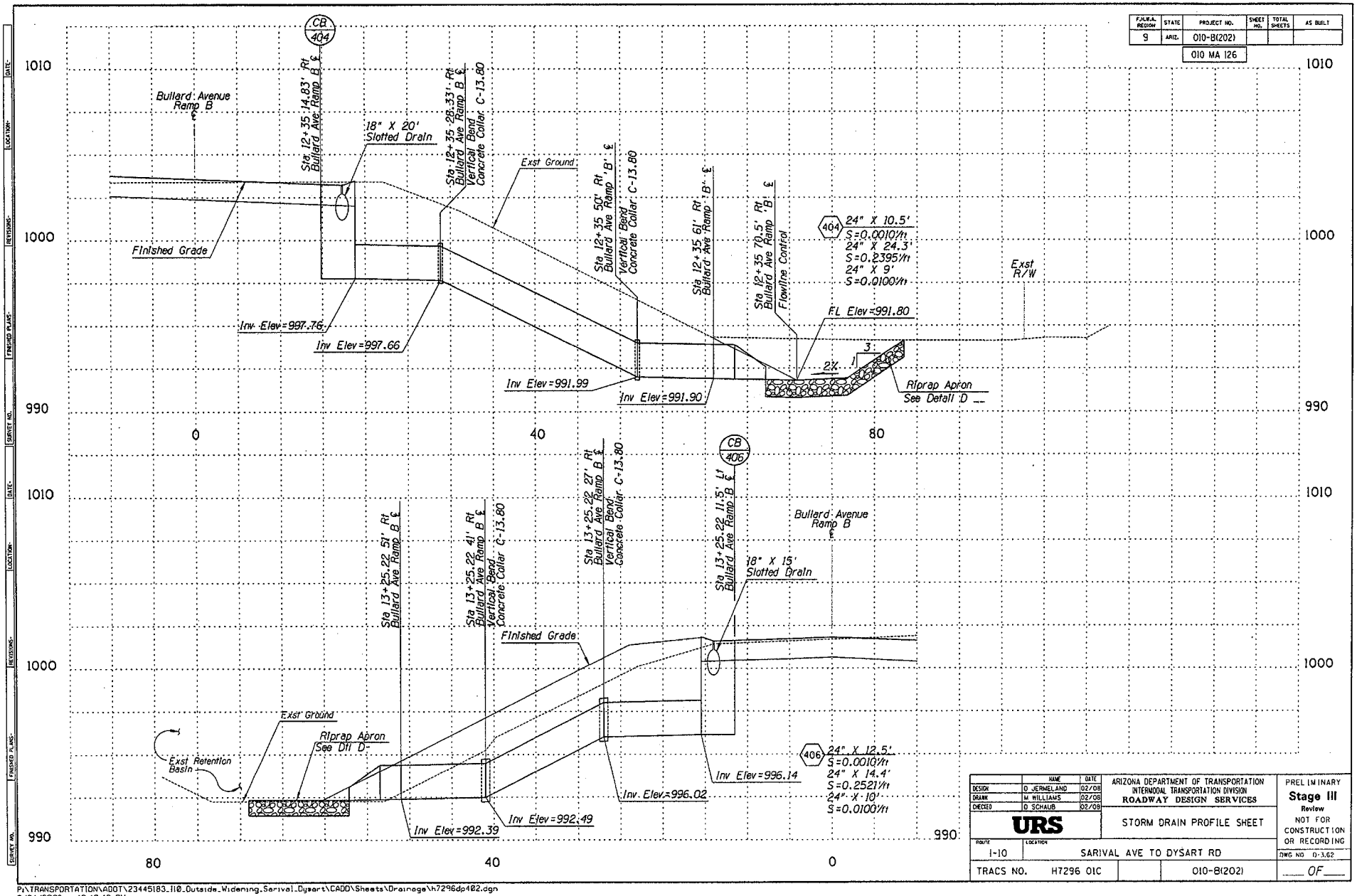

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		
TRACS NO.	H7296 01C		010-B(202)

DWG NO D-3.62

____ OF ____

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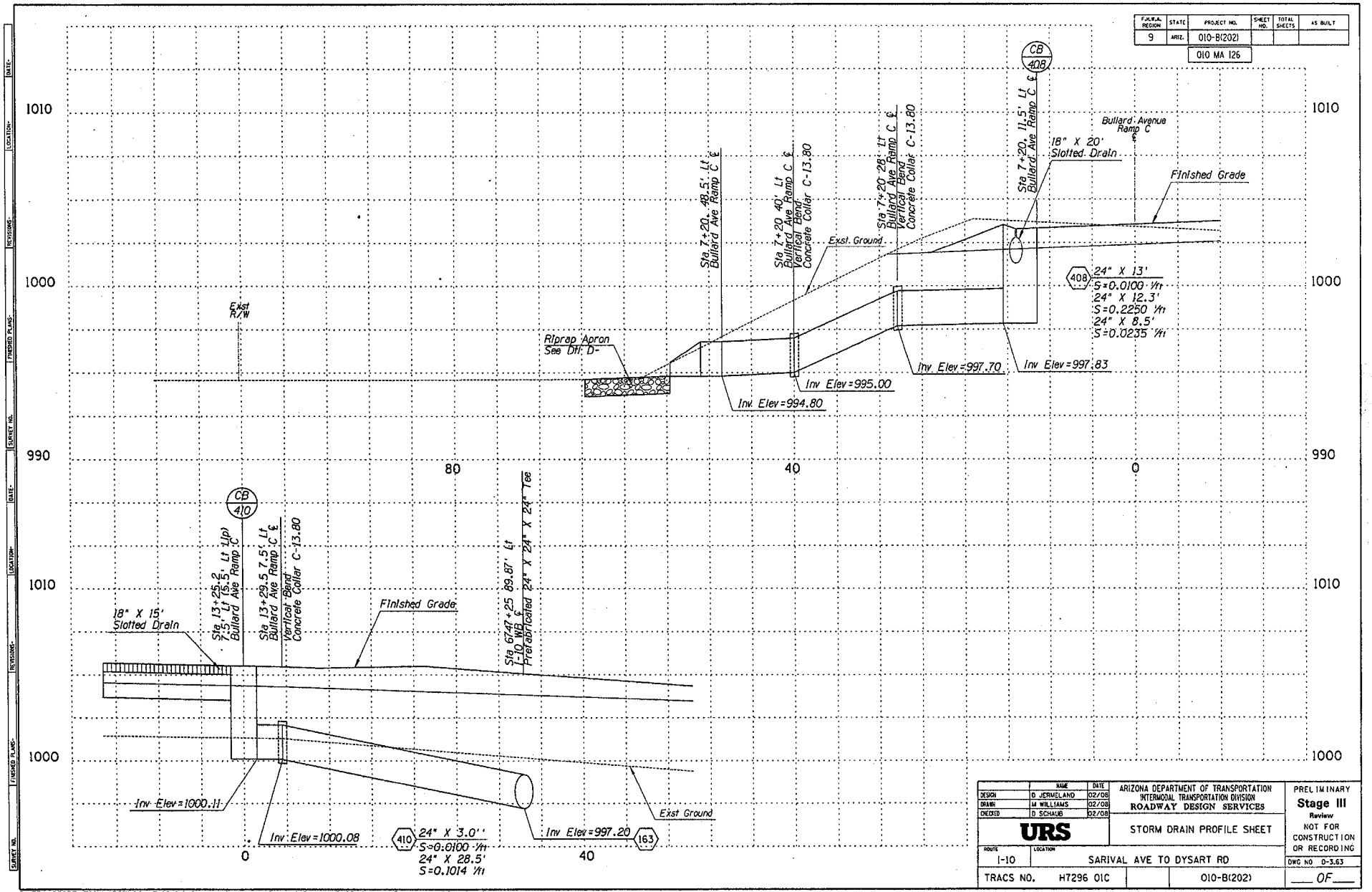

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.63

___ OF ___

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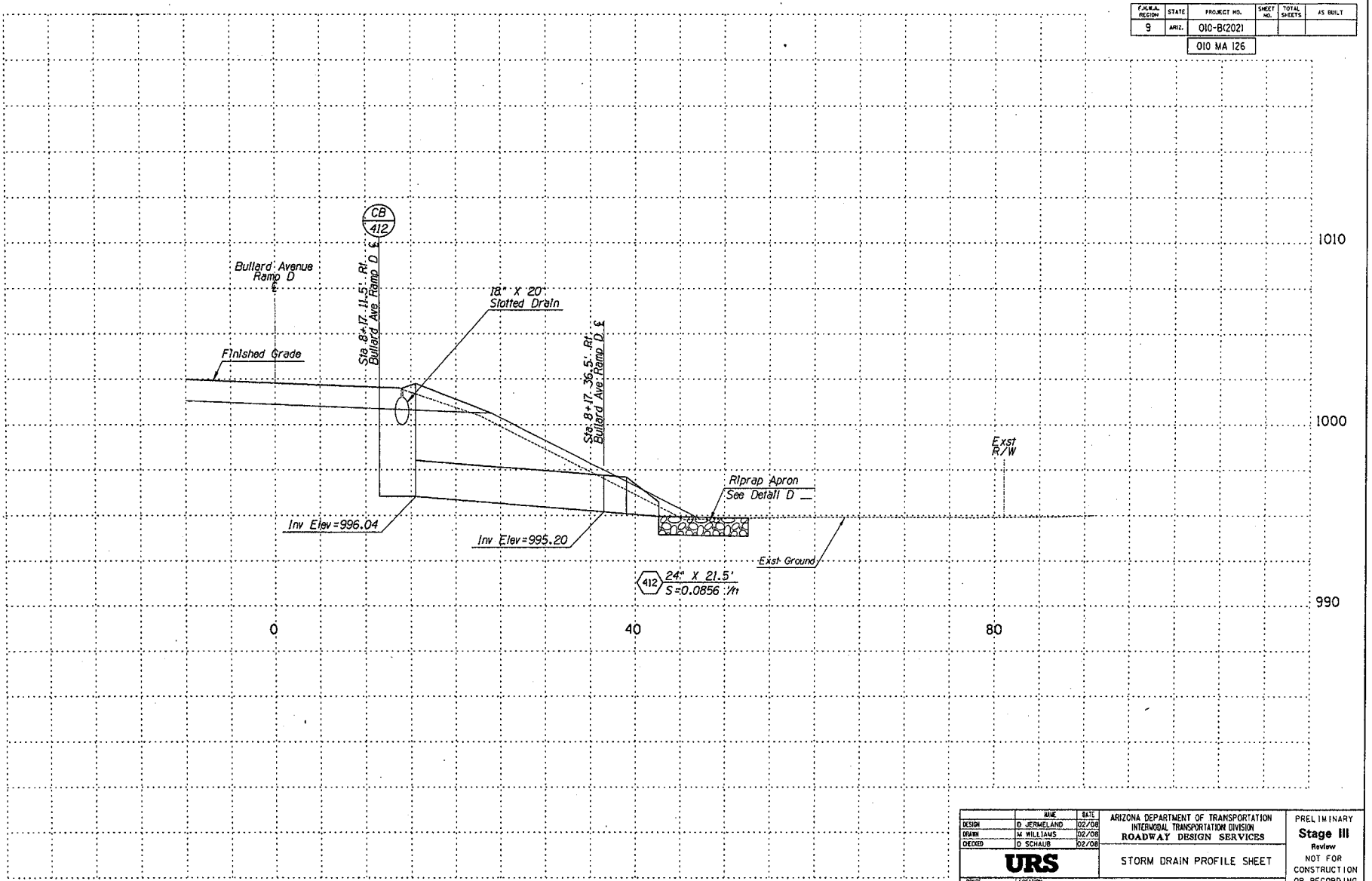

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D. JERMELAND	02/08
DRAWN	M. WILLIAMS	02/08
CHECKED	D. SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.64

___ OF ___

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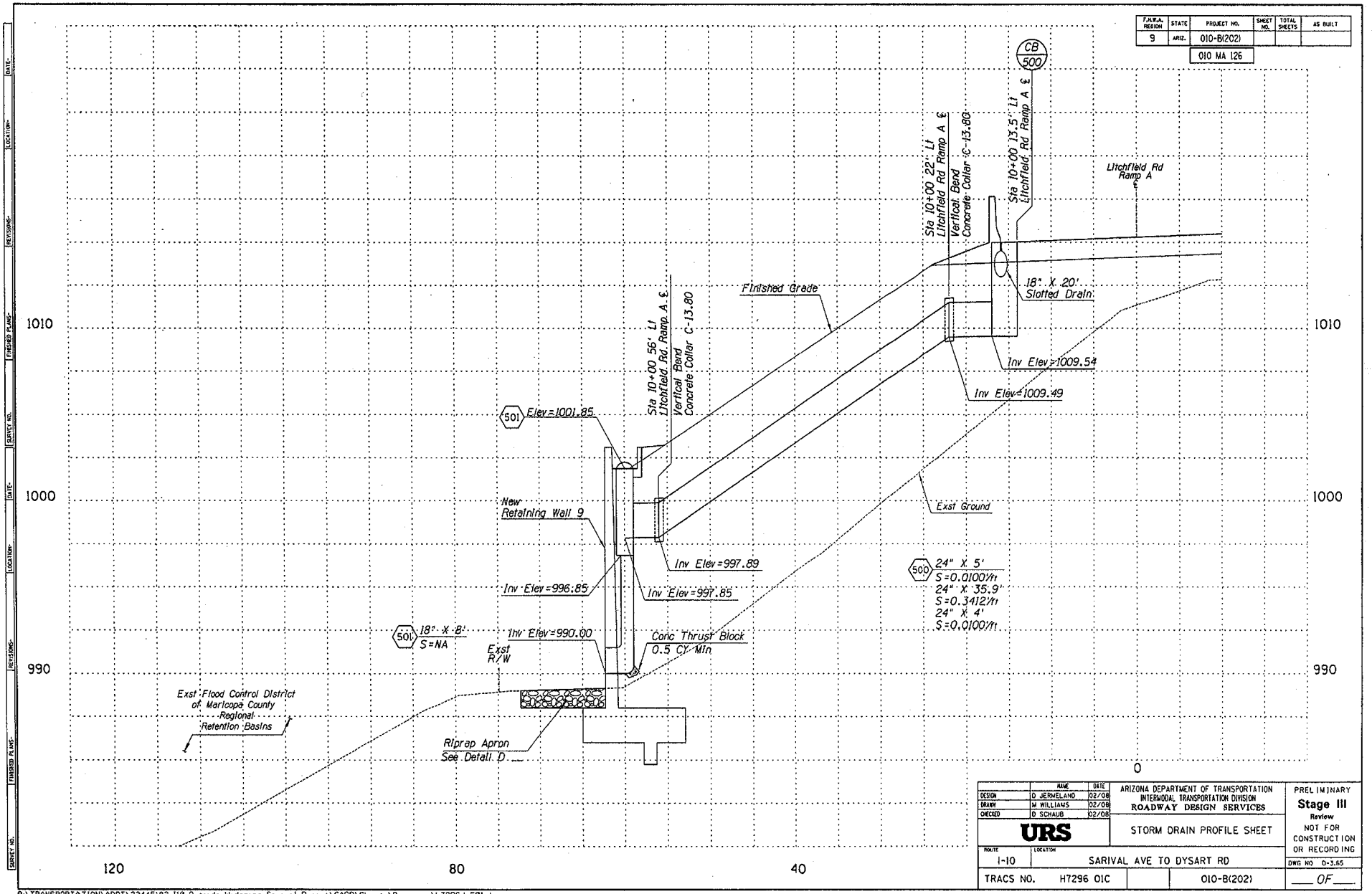

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.65

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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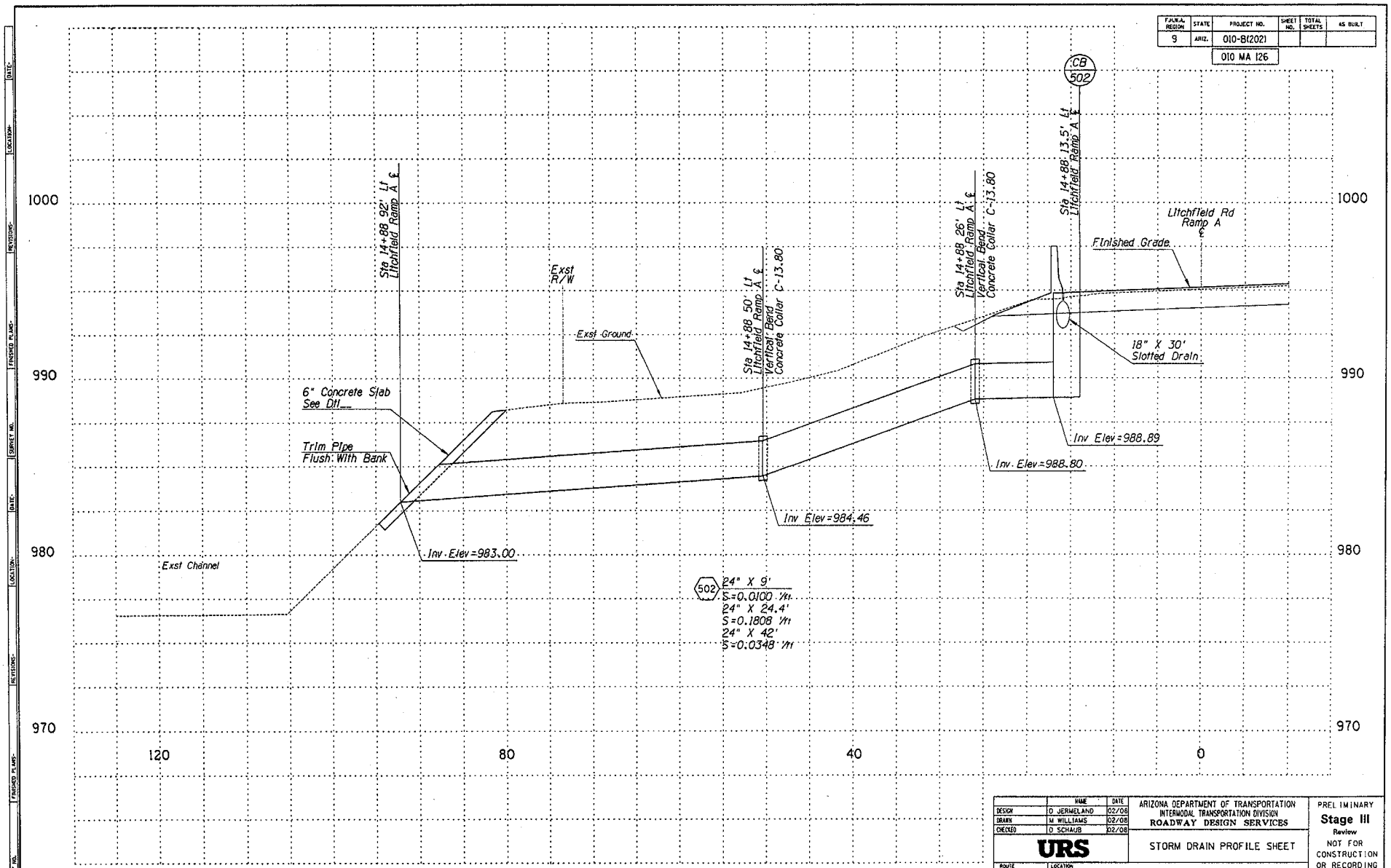

FAI/W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.66

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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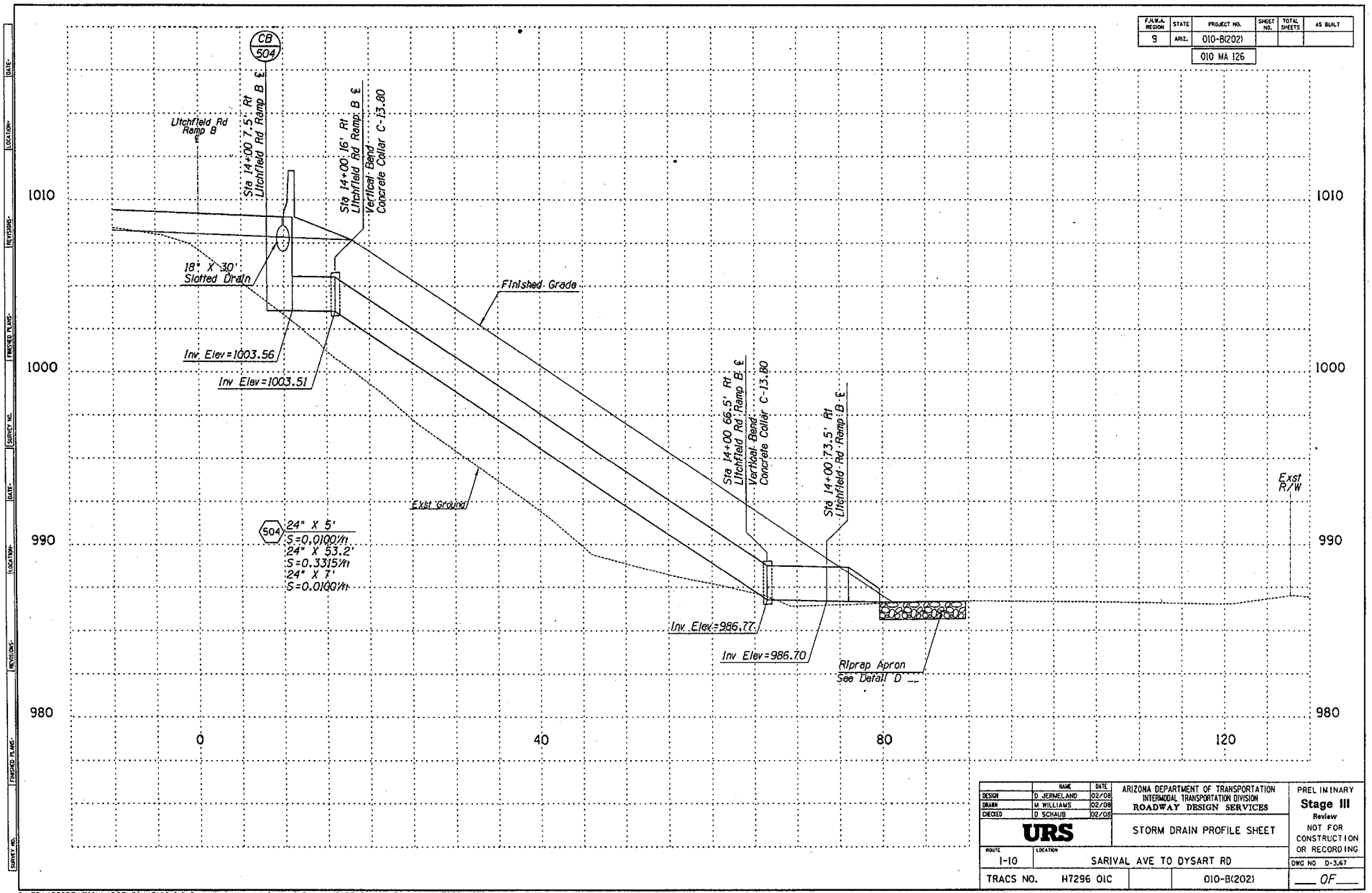

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE: I-10 LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.67

___ OF ___

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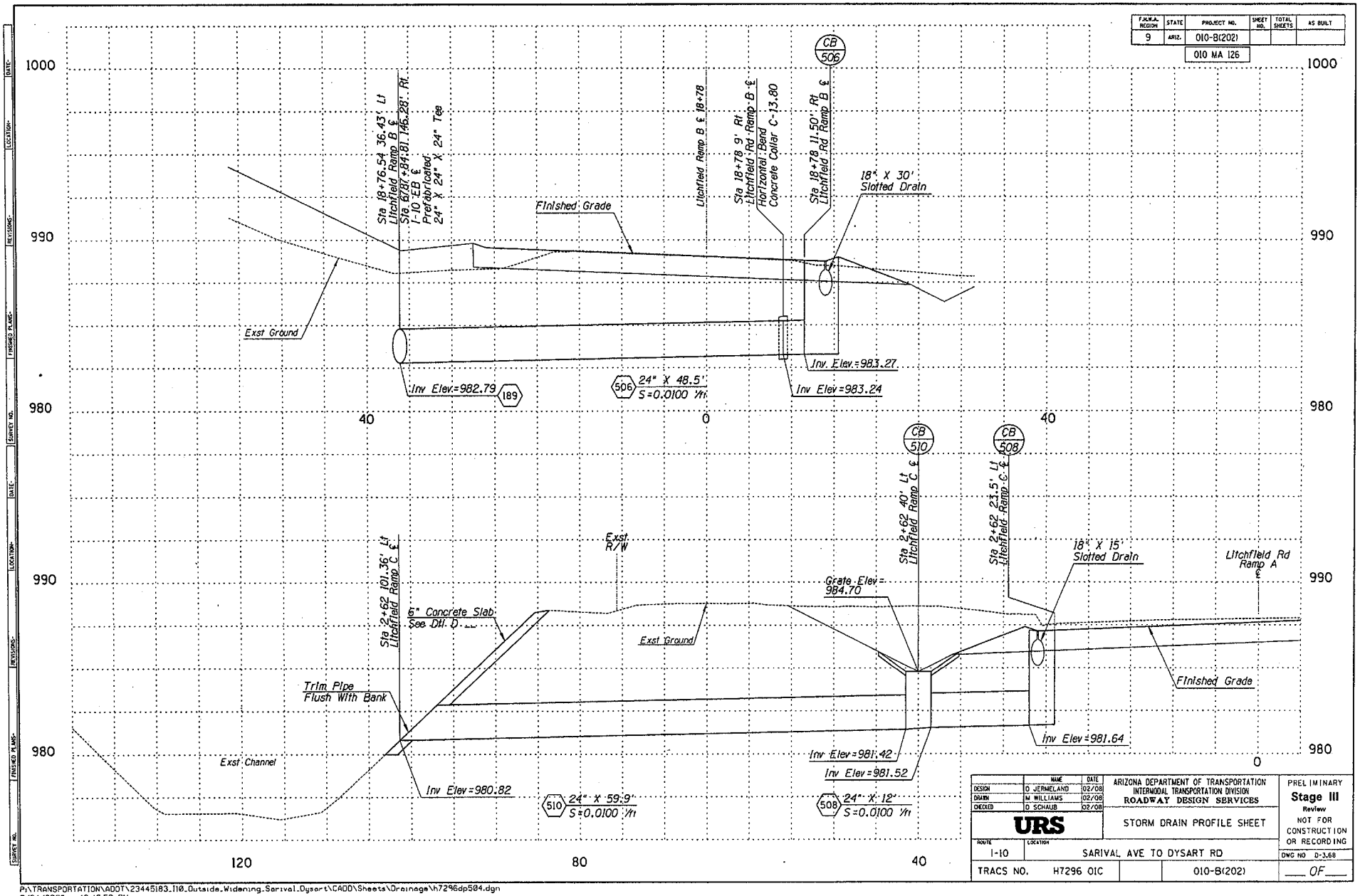

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	O JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	O SCHAUB	02/08

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

URS

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

DWG NO D-3.68

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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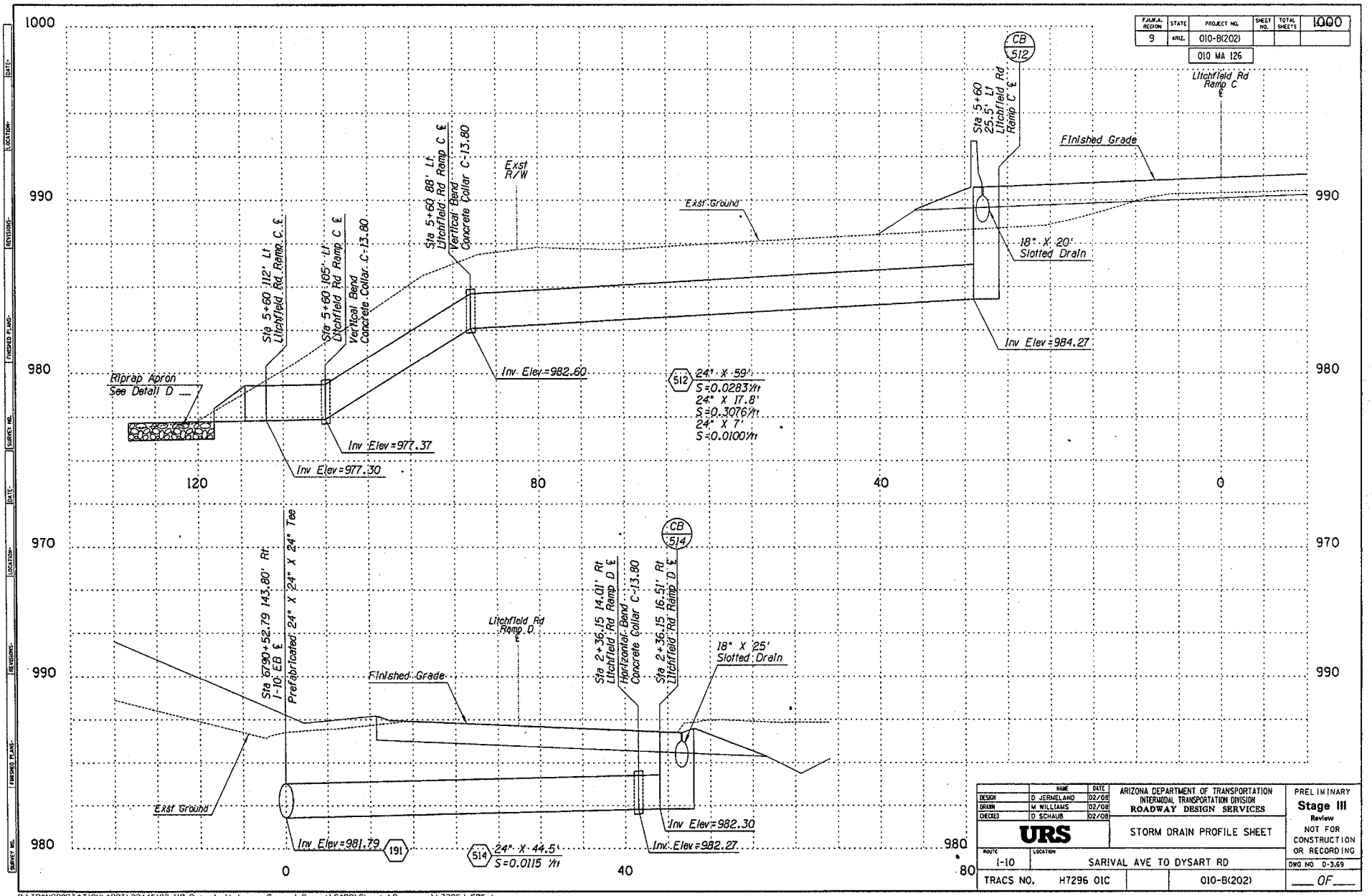

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	ARIZ.	010-B(202)		
		010 MA 126		

1000

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

ROUTE: I-10 | LOCATION: SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-3.69

___ OF ___

P:\TRANSPORTATION\ADOT\23445183_110_Outside_Widening_Sarival_Dysart\CADD\Sheets\Drainage\h7296dp505.dgn
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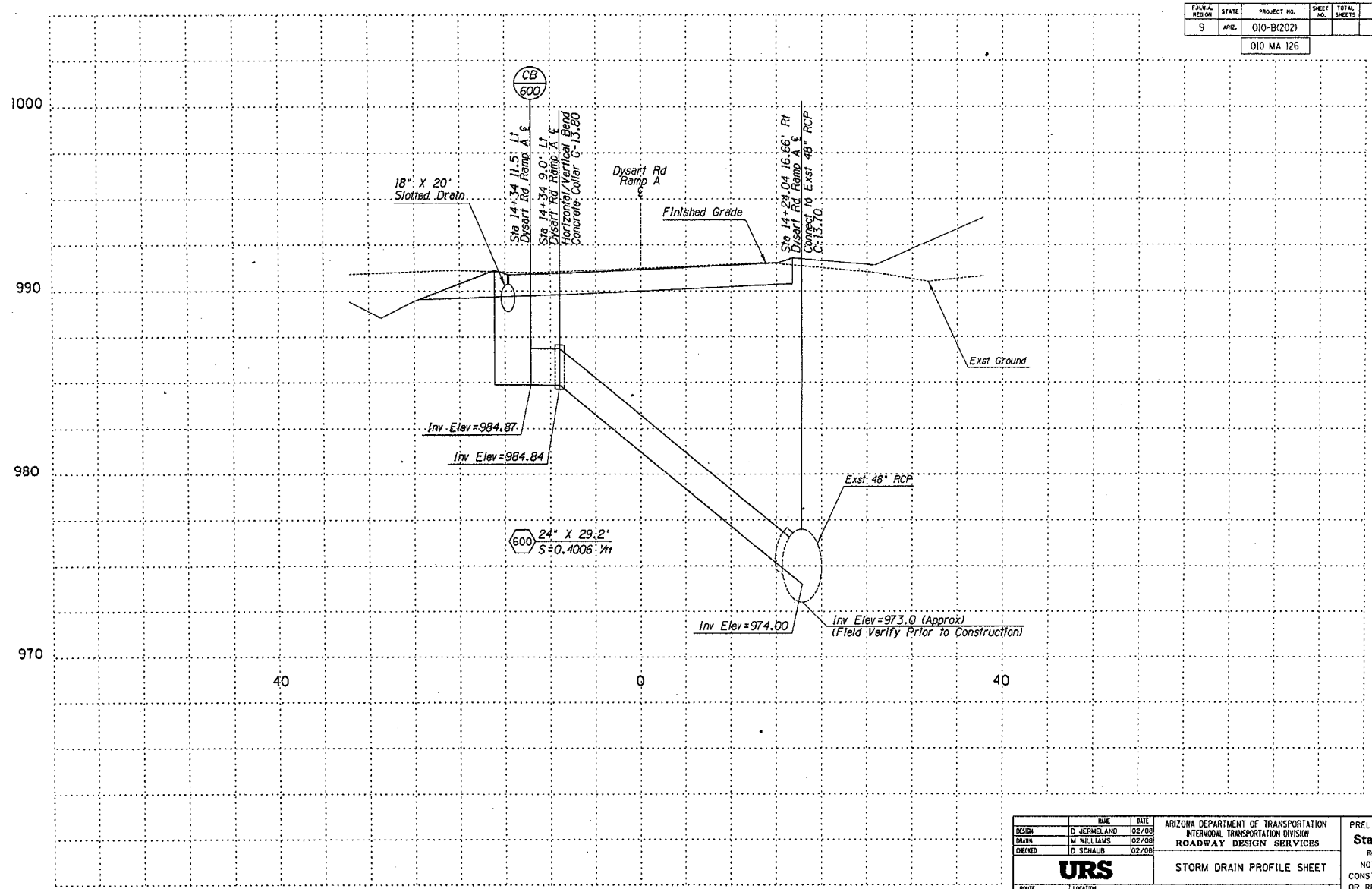

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

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STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-3.70

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

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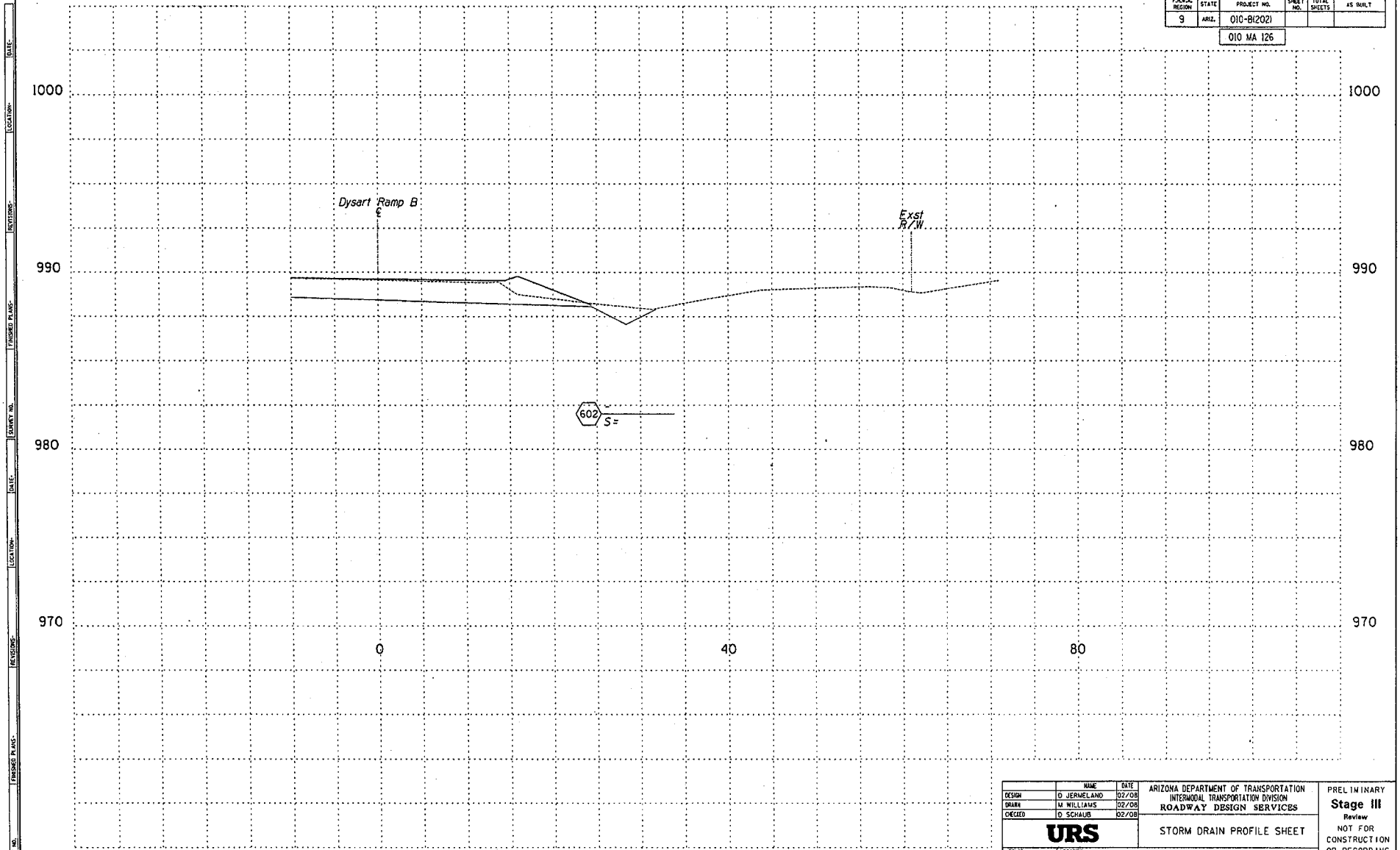
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		
TRACS NO. H7296 01C		010-B(202)	

DWG NO D-3.71

___ OF ___

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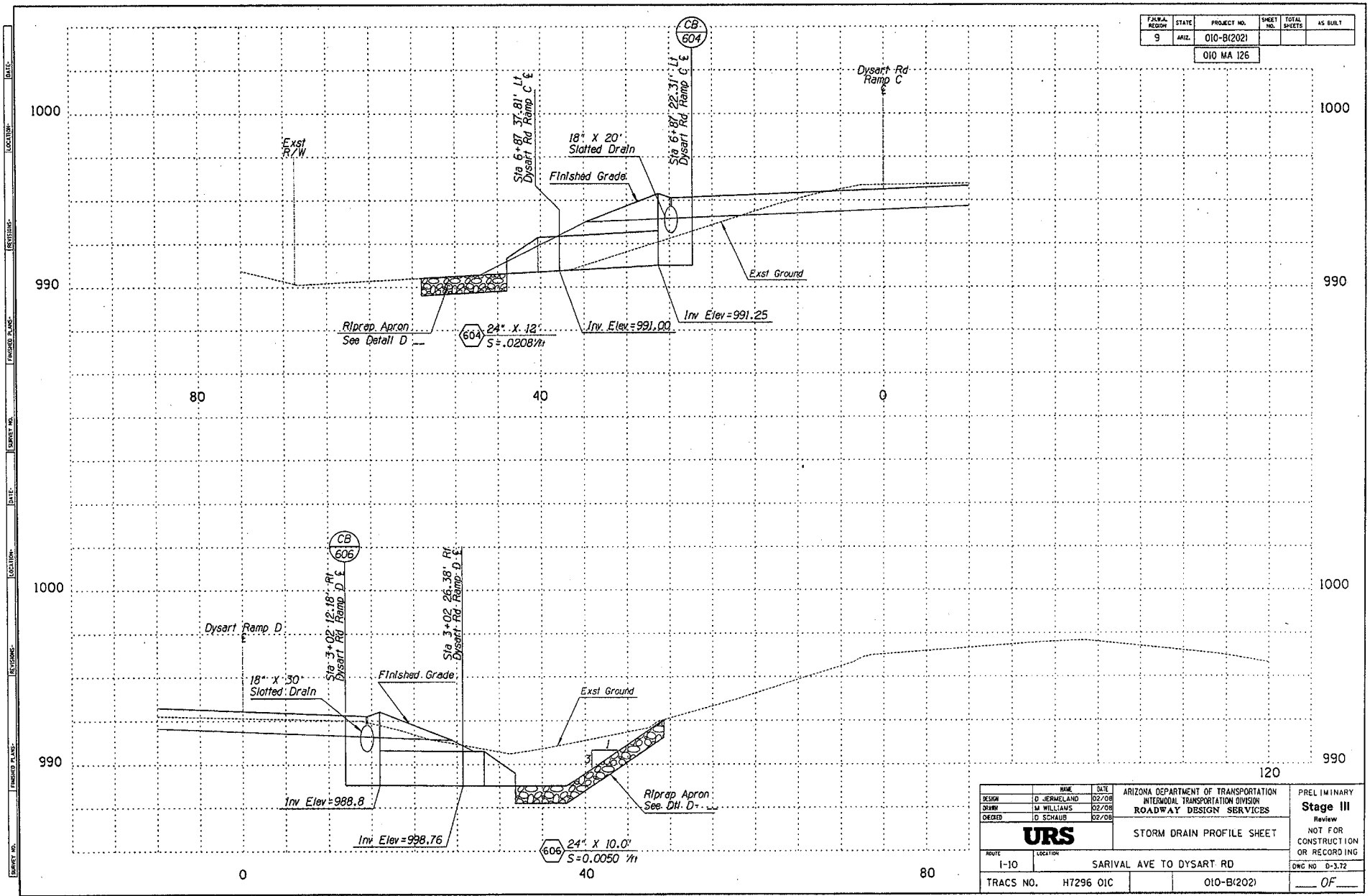

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JIERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

STORM DRAIN PROFILE SHEET

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION		
I-10	SARIVAL AVE TO DYSART RD		DWG NO D-3.72
TRACS NO. H7296 01C		010-B(202)	___ OF ___

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2/24/2008 12:41:09 PM

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Arizona 33.46057 N 112.37546 W 997 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006
Extracted: Tue Feb 26 2008

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Help | D

Precipitation Intensity Estimates (in/hr)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	2.34	1.78	1.47	0.99	0.61	0.34	0.24	0.14	0.08	0.05	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00
2	3.06	2.33	1.92	1.29	0.80	0.45	0.31	0.18	0.10	0.06	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00
5	4.15	3.16	2.61	1.76	1.09	0.60	0.41	0.23	0.12	0.08	0.04	0.02	0.02	0.01	0.01	0.01	0.00	0.00
10	4.99	3.80	3.14	2.11	1.31	0.71	0.49	0.27	0.14	0.09	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00
25	6.11	4.65	3.84	2.59	1.60	0.87	0.60	0.33	0.17	0.11	0.06	0.04	0.02	0.02	0.01	0.01	0.01	0.00
50	6.98	5.31	4.39	2.96	1.83	0.99	0.69	0.37	0.19	0.13	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
100	7.87	5.99	4.95	3.33	2.06	1.12	0.78	0.42	0.22	0.15	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01
200	8.77	6.68	5.52	3.72	2.30	1.25	0.87	0.47	0.24	0.16	0.09	0.05	0.03	0.03	0.01	0.01	0.01	0.01
500	9.97	7.58	6.27	4.22	2.61	1.42	1.01	0.53	0.27	0.19	0.11	0.06	0.04	0.03	0.02	0.01	0.01	0.01
1000	10.88	8.29	6.85	4.61	2.85	1.56	1.12	0.59	0.30	0.21	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01

Text version of table

* These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	2.89	2.20	1.82	1.22	0.76	0.42	0.29	0.17	0.09	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
2	3.78	2.87	2.38	1.60	0.99	0.54	0.38	0.21	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00
5	5.11	3.89	3.21	2.16	1.34	0.72	0.50	0.27	0.14	0.09	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00
10	6.11	4.65	3.84	2.59	1.60	0.86	0.59	0.32	0.17	0.11	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.00
25	7.46	5.68	4.70	3.16	1.96	1.04	0.72	0.39	0.20	0.13	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
50	8.48	6.46	5.34	3.59	2.22	1.19	0.82	0.44	0.23	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01
100	9.55	7.27	6.00	4.04	2.50	1.33	0.93	0.49	0.25	0.16	0.09	0.05	0.03	0.03	0.01	0.01	0.01	0.01
200	10.66	8.11	6.70	4.51	2.79	1.49	1.04	0.55	0.28	0.18	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01
500	12.12	9.23	7.62	5.13	3.18	1.70	1.21	0.63	0.32	0.21	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01
1000	13.26	10.09	8.34	5.61	3.47	1.87	1.34	0.69	0.35	0.23	0.13	0.08	0.05	0.04	0.02	0.02	0.01	0.01

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

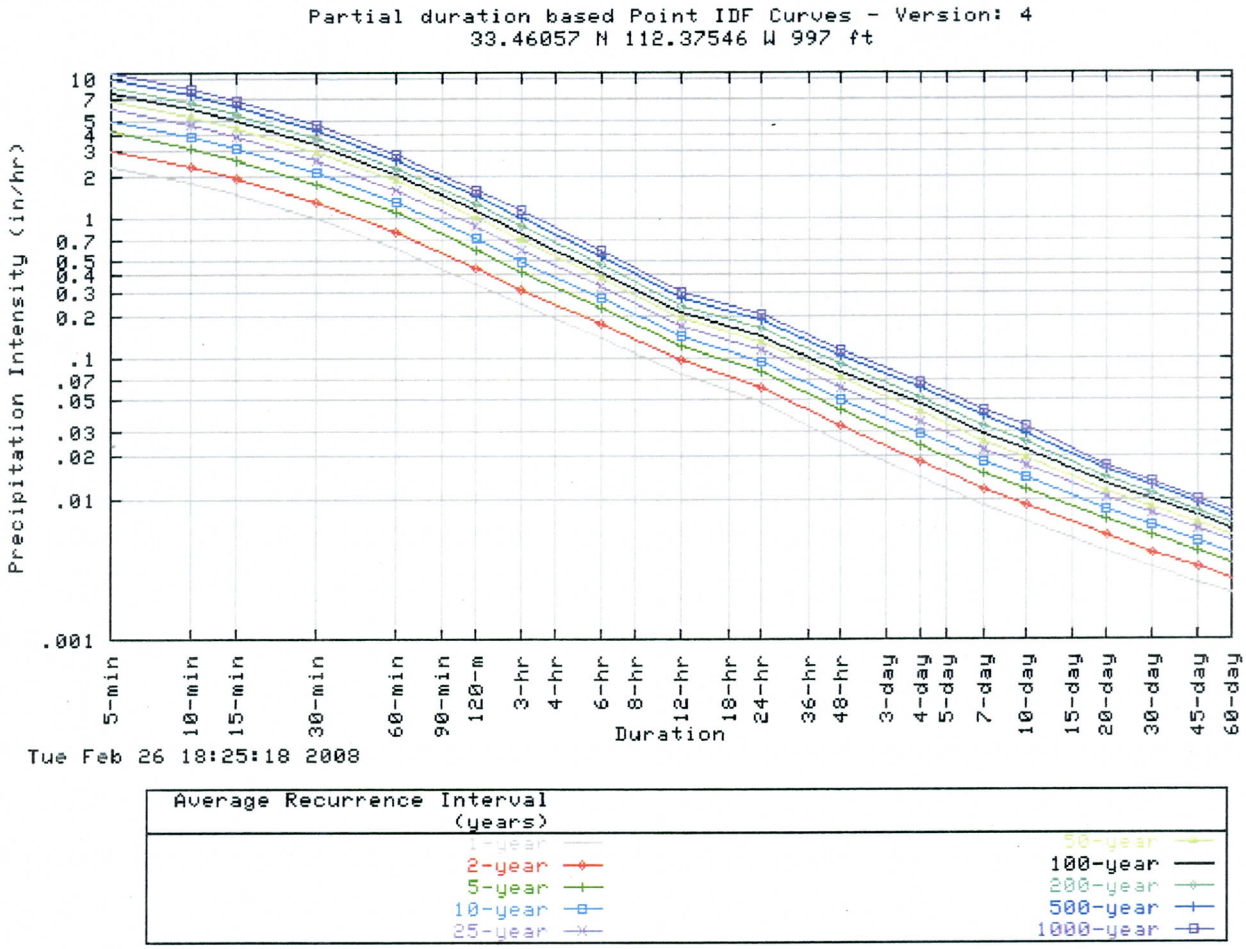
* Lower bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day

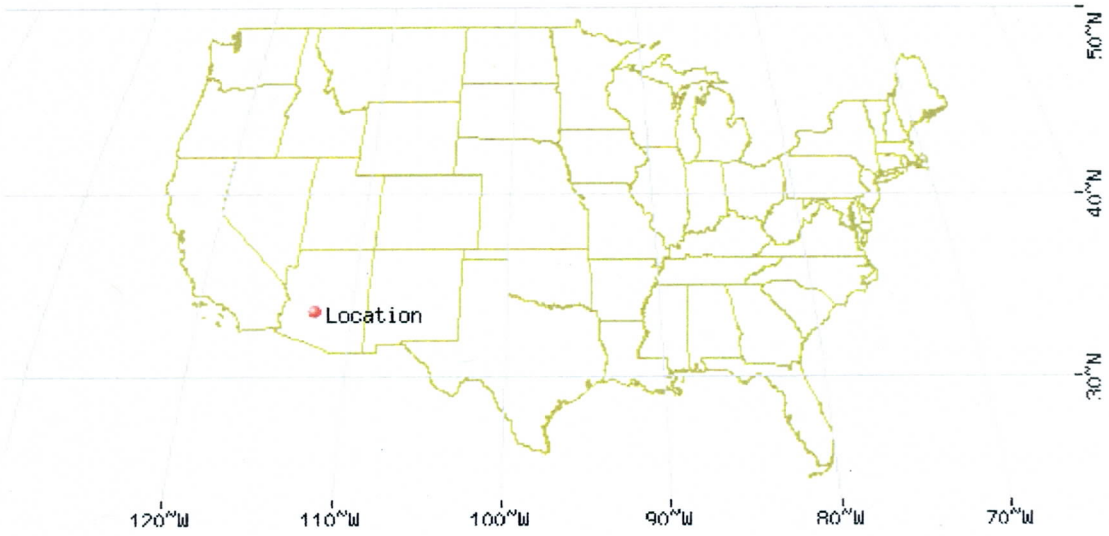
1	1.93	1.46	1.21	0.82	0.51	0.29	0.20	0.12	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
2	2.53	1.92	1.59	1.07	0.66	0.37	0.26	0.15	0.08	0.06	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
5	3.41	2.59	2.14	1.44	0.89	0.50	0.34	0.20	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00
10	4.07	3.10	2.56	1.72	1.07	0.59	0.41	0.23	0.12	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00
25	4.92	3.74	3.10	2.08	1.29	0.71	0.49	0.27	0.15	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.00
50	5.54	4.22	3.49	2.35	1.45	0.80	0.55	0.31	0.16	0.11	0.06	0.04	0.02	0.02	0.01	0.01	0.01	0.00
100	6.14	4.67	3.86	2.60	1.61	0.89	0.62	0.34	0.18	0.13	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
200	6.73	5.12	4.24	2.85	1.76	0.97	0.68	0.37	0.20	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01
500	7.45	5.68	4.69	3.16	1.95	1.08	0.76	0.41	0.21	0.16	0.09	0.05	0.03	0.03	0.01	0.01	0.01	0.01
1000	7.98	6.07	5.02	3.38	2.09	1.16	0.82	0.44	0.23	0.18	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01

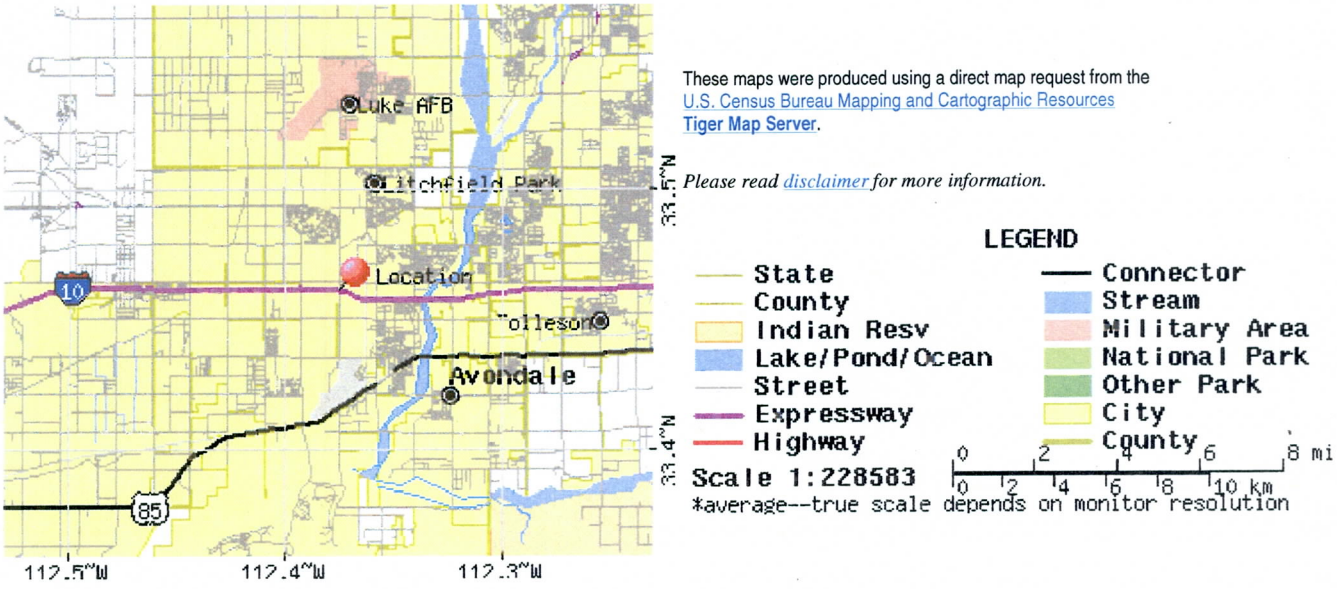
* The **lower** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **less** than.
** These precipitation frequency estimates are based on a partial duration maxima series. **ARI** is the Average Recurrence Interval.

Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.



Maps -





Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available
from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information
about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study,

please refer to our documentation.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

+/-30 minutes ...OR... +/-1 degree of this location (33.46057/-112.37546). Digital ASCII data can be obtained directly from **NCDC**.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the **Western Regional Climate Center's state-specific SNOTEL station maps**.

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910

(301) 713-1669
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX D

ONSITE HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Time of Concentration
&
Rational Method Computations

I-10 EB & WB

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB100	Date:	10/16/07
Station:	6665+75 I-10 EB East End		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.68	0.95	0.6
			0.0
			0.0
	0.68		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1014.6	Upstream elevation, feet
	1011.06	Downstream elevation, feet
L =	349.9	feet
L =	0.0663	miles
S =	53.419	feet/mile
K_b =	0.0411	

where:

A =	0.68	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.87	
15	3.14	6.31	
30	2.11	7.34	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	2.44	cfs
Q_B =	0.00	cfs (upstream bypass flow)
Q_T =	2.44	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB102	Date:	10/16/07
Station:	6667+48.52 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.88	0.95	0.8
			0.0
			0.0
	0.88		0.8

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.66	Upstream elevation, feet
	1011.65	Downstream elevation, feet
L =	412.9	feet
L =	0.0782	miles
S =	64.066	feet/mile
K_b =	0.0404	

where:

A =	0.88	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.97	
15	3.14	6.42	
30	2.11	7.47	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.17	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.17	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB104	Date:	10/15/07
Station:	6667+80 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.95	0.95	0.9
			0.0
			0.0
	0.95		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.95	Upstream elevation, feet
	1011.7	Downstream elevation, feet
L =	429	feet
L =	0.0813	miles
S =	64.615	feet/mile
K_b =	0.0401	

where:

A =	0.95	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.06	
15	3.14	6.51	
30	2.11	7.57	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.44	cfs
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.44	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB106	Date:	11/2/07
Station:	6670+20 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.32	0.95	1.3
			0.0
			0.0
	1.32		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

1018.4		Upstream elevation, feet
1013.8		Downstream elevation, feet
L = 510		feet
L = 0.0966		miles
S = 47.624		feet/mile
K_b = 0.0392		

where: A = 1.32 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.18	
15	3.14	7.72	
30	2.11	8.97	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **4.77** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **4.77** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB108	Date:	10/15/07
Station:	6670+50 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.64	0.95	0.6
			0.0
			0.0
	0.64		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.94	Upstream elevation, feet
	1013.76	Downstream elevation, feet
L =	314	feet
L =	0.0595	miles
S =	36.657	feet/mile
K_b =	0.0412	

where:

A =	0.64	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.26	
15	3.14	6.74	
30	2.11	7.83	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.30**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.30**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB114 (interim Catch Basin)	Date:	12/5/07
Station:	6678+83 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.55	0.95	0.5
			0.0
			0.0
	0.55		0.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1026.93	Upstream elevation, feet
	1024.19	Downstream elevation, feet
L =	251	feet
L =	0.0475	miles
S =	57.638	feet/mile
K_b =	0.0416	

where: A = 0.55 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	4.89	
15	3.14	5.26	
30	2.11	6.12	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where: Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.98** cfs
Q_B = **0.00** cfs (upstream bypass flow)
Q_T = **1.98** cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB116	Date:	11/2/07
Station:	6686+80 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.54	0.95	0.5
			0.0
			0.0
	0.54		0.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1026.12	Upstream elevation, feet
	1024.29	Downstream elevation, feet
L =	350	feet
L =	0.0663	miles
S =	27.607	feet/mile
K_b =	0.0417	

where:

A =	0.54	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.26	
15	3.14	7.81	
30	2.11	9.08	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.95**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.95**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB120		Date:	12/5/07
Station:	6695+75 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.24	0.95	1.2
			0.0
			0.0
	1.24		1.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1024.45	Upstream elevation, feet
	1012.43	Downstream elevation, feet
L =	495	feet
L =	0.0938	miles
S =	128.213	feet/mile
K_b =	0.0394	

where: A = 1.24 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.21	
15	3.14	5.60	
30	2.11	6.52	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	4.46	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	4.46	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB122	Date:	10/16/07
Station:	6699+75 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.53	0.95	1.5
			0.0
			0.0
	1.53		1.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.33	Upstream elevation, feet
	1005.12	Downstream elevation, feet
L =	620	feet
L =	0.1174	miles
S =	95.466	feet/mile
K_b =	0.0388	

where:

A =	1.53	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.34	
15	3.14	6.82	
30	2.11	7.93	***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**5.52**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**5.52**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB124	Date:	10/15/07
Station:	6700+14 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.43	0.95	1.4
			0.0
			0.0
	1.43		1.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.06	Upstream elevation, feet
	1004.62	Downstream elevation, feet
L =	594	feet
L =	0.1125	miles
S =	92.800	feet/mile
K_b =	0.0390	

where:

A =	1.43	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.28	
15	3.14	6.75	
30	2.11	7.85	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	5.18	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	5.18	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB126	Date:	10/16/07
Station:	6706+87.53 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	2.06	0.95	2.0
			0.0
			0.0
	2.06		2.0

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1007.73	Upstream elevation, feet
	997.62	Downstream elevation, feet
L =	843	feet
L =	0.1597	miles
S =	63.322	feet/mile
K_b =	0.0380	

where:

A =	2.06	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.31	
15	3.14	8.93	
30	2.11	10.39	***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	7.44	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	7.44	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB128		Date:	10/15/07
Station:	6707+21.18 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	2.07	0.95	2.0
			0.0
			0.0
	2.07		2.0

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1007.18	Upstream elevation, feet
	997.44	Downstream elevation, feet
L =	835	feet
L =	0.1581	miles
S =	61.589	feet/mile
K_b =	0.0380	

where:

A =	2.07	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.34	
15	3.14	8.97	
30	2.11	10.43	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	7.48	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	7.48	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB130	Date:	10/15/07
Station:	6710+40.25 I-10 EB (East)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.22	0.95	1.2
			0.0
			0.0
	1.22		1.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1000.6	Upstream elevation, feet
	996.79	Downstream elevation, feet
L =	544.8	feet
L =	0.1032	miles
S =	36.925	feet/mile
K_b =	0.0395	

where:

A =	1.22	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.05	
15	3.14	8.65	
30	2.11	10.06	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.39**	cfs
Q_B =	**0.70**	**cfs (bypass flow from existing catch basin)**
Q_T =	**5.09**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB130	Date:	10/15/07
Station:	6710+40.25 I-10 EB (West)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.26	0.95	0.2
			0.0
			0.0
	0.26		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	999.34	Upstream elevation, feet
	996.79	Downstream elevation, feet
L =	212.9	feet
L =	0.0403	miles
S =	63.241	feet/mile
K_b =	0.0437	

where: A = 0.26 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	4.49
15	3.14	4.83
30	2.11	5.61

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.92** **cfs**
Q_B = **0.70** **cfs (bypass flow from existing catch basin)**
Q_T = **1.62** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB132	Date:	10/16/07
Station:	6710+49.64 I-10 WB (East)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.81	0.95	0.8
			0.0
			0.0
	0.81		0.8

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	999.96	Upstream elevation, feet
	996.64	Downstream elevation, feet
L =	396	feet
L =	0.0750	miles
S =	44.267	feet/mile
K_b =	0.0406	

where:

A =	0.81	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.58	
15	3.14	7.08	
30	2.11	8.23	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.92**	**cfs**
Q_B =	**0.80**	**cfs (upstream bypass flow)**
Q_T =	**3.72**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB132	Date:	10/16/07
Station:	6710+49.64 I-10 WB (West)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.38	0.95	0.4
			0.0
			0.0
	0.38		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	999.27	Upstream elevation, feet
	996.64	Downstream elevation, feet
L =	255.9	feet
L =	0.0485	miles
S =	54.265	feet/mile
K_b =	0.0426	

where: A = 0.38 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.10	
15	3.14	5.48	
30	2.11	6.37	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.38**	**cfs**
Q_B =	**0.80**	**cfs (upstream bypass flow)**
Q_T =	**2.18**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB136	Date:	10/15/07
Station:	6715+80 I-10 EB (East)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.96	0.95	0.9
			0.0
			0.0
	0.96		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1005.98	Upstream elevation, feet
	997.68	Downstream elevation, feet
L =	455	feet
L =	0.0862	miles
S =	96.316	feet/mile
K_b =	0.0401	

where:

A =	0.96	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	5.51
15	3.14	5.92
30	2.11	6.89

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.47	cfs
Q_B =	0.00	cfs (upstream bypass flow)
Q_T =	3.47	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB136	Date:	10/15/07
Station:	6715+80 I-10 EB (West)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.35	0.95	0.3
			0.0
			0.0
	0.35		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1000.65	Upstream elevation, feet
	997.68	Downstream elevation, feet
L =	245	feet
L =	0.0464	miles
S =	64.007	feet/mile
K_b =	0.0428	

where: A = 0.35 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	4.75	
15	3.14	5.11	
30	2.11	5.94	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = 1.27 **cfs**
Q_B = 0.00 **cfs (upstream bypass flow)**
Q_T = 1.27 **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB138	Date:	12/17/07
Station:	6719+10 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.98	0.95	0.9
	0.98		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1010.88	Upstream elevation, feet
	1001.02	Downstream elevation, feet
L =	460	feet
L =	0.0871	miles
S =	113.176	feet/mile
K_b =	0.0401	

where:

A =	0.98	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.27	
15	3.14	5.66	
30	2.11	6.59	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.53	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.53	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB140	Date:	12/17/07
Station:	6719+10 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.92	0.95	0.9
Infield Area	0.05	0.7	0.0
	0.96		0.9

Weighted C-Coefficient: **0.94**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.09	Upstream elevation, feet
	1005.55	Downstream elevation, feet
L =	420	feet
L =	0.0795	miles
S =	119.931	feet/mile
K_b =	0.0401	

where:

A =	0.96	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	4.95	
15	3.14	5.32	
30	2.11	6.18	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**3.44**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**3.44**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB148	Date:	10/15/07
Station:	6725+12.15 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.23	0.95	1.2
			0.0
			0.0
	1.23		1.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1020.35	Upstream elevation, feet
	1010.6	Downstream elevation, feet
L =	549.9	feet
L =	0.1041	miles
S =	93.617	feet/mile
K_b =	0.0394	

where:

A =	1.23	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.06	
15	3.14	6.51	
30	2.11	7.58	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.44**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.44**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB152	Date:	10/15/07
Station:	6729+65 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.17	0.95	1.1
			0.0
			0.0
	1.17		1.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1022.19	Upstream elevation, feet
	1016.11	Downstream elevation, feet
L =	589	feet
L =	0.1116	miles
S =	54.503	feet/mile
K_b =	0.0396	

where:

A =	1.17	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.43	
15	3.14	7.99	
30	2.11	9.29	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.21**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.21**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB154	Date:	10/15/07
Station:	6740+40 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.33	0.95	1.3
			0.0
			0.0
	1.33		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1022.19	Upstream elevation, feet
	1016.59	Downstream elevation, feet
L =	684.5	feet
L =	0.1296	miles
S =	43.196	feet/mile
K_b =	0.0392	

where:

A =	1.33	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	8.57
15	3.14	9.21
30	2.11	10.71

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	4.82	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	4.82	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB156	Date:	10/16/07
Station:	6747+30 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.35	0.95	1.3
			0.0
			0.0
	1.35		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1021.12	Upstream elevation, feet
	1016.72	Downstream elevation, feet
L =	653	feet
L =	0.1237	miles
S =	35.577	feet/mile
K_b =	0.0392	

where:

A =	1.35	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.88	
15	3.14	9.55	
30	2.11	11.11	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.87**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.87**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB158		Date:	10/15/07
Station:	6746+09 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.40	0.95	1.3
			0.0
			0.0
	1.40		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.58	Upstream elevation, feet
	1008.46	Downstream elevation, feet
L =	699.5	feet
L =	0.1325	miles
S =	76.388	feet/mile
K_b =	0.0391	

where: A = 1.40 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.24	
15	3.14	7.79	
30	2.11	9.06	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where: Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **5.05** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **5.05** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB160	Date:	10/15/07
Station:	6747+48 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.36	0.95	0.3
			0.0
			0.0
	0.36		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1010.5	Upstream elevation, feet
	1006.59	Downstream elevation, feet
L =	239.5	feet
L =	0.0454	miles
S =	86.200	feet/mile
K_b =	0.0428	

where:

A =	0.36	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	4.28
15	3.14	4.60
30	2.11	5.35

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	1.30	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	1.30	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB162	Date:	10/16/07
Station:	6746+89.67 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	2.02	0.95	1.9
			0.0
			0.0
	2.02		1.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.74	Upstream elevation, feet
	1007.3	Downstream elevation, feet
L =	760.7	feet
L =	0.1441	miles
S =	79.405	feet/mile
K_b =	0.0381	

where: A = 2.02 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	7.36
15	3.14	7.92
30	2.11	9.21

***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = 7.28 cfs
Q_B = 0.00 cfs (upstream bypass flow)
Q_T = 7.28 cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB164	Date:	11/6/07
Station:	6751+25 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.29	0.95	1.2
ROW	0.004	0.7	0.0
	1.29		1.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1009.46	Upstream elevation, feet
	999.58	Downstream elevation, feet
L =	558	feet
L =	0.1057	miles
S =	93.488	feet/mile
K_b =	0.0393	

where:

A =	1.29	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.09
15	3.14	6.55
30	2.11	7.62

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.65**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.65**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB166	Date:	11.06/07
Station:	6754+87.55 I-10 WB (West End)		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.97	0.95	0.9
ROW		0.7	0.0
	0.97		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

1004.14		Upstream elevation, feet
998		Downstream elevation, feet
L = 480		feet
L = 0.0909		miles
S = 67.540		feet/mile
K_b = 0.0401		

where: A = 0.97 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.32	
15	3.14	6.79	
30	2.11	7.90	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **3.49** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **3.49** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB168	Date:	10/16/07
Station:	6755+09.39 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.12	0.95	1.1
			0.0
			0.0
	1.12		1.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1005.31	Upstream elevation, feet
	998.48	Downstream elevation, feet
L =	690	feet
L =	0.1307	miles
S =	52.264	feet/mile
K_b =	0.0397	

where:

A =	1.12	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.16	
15	3.14	8.77	
30	2.11	10.20	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.06**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.06**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB170	Date:	10/16/07
Station:	6759+81.32 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.42	0.95	1.3
			0.0
			0.0
	1.42		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1010.61	Upstream elevation, feet
	1001.37	Downstream elevation, feet
L =	690	feet
L =	0.1307	miles
S =	70.706	feet/mile
K_b =	0.0390	

where:

A =	1.42	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.36	
15	3.14	7.92	
30	2.11	9.21	***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**5.13**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**5.13**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB172	Date:	10/16/07
Station:	6765+70.12 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.59	0.95	1.5
			0.0
			0.0
	1.59		1.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1014.13	Upstream elevation, feet
	1006.67	Downstream elevation, feet
L =	781	feet
L =	0.1479	miles
S =	50.434	feet/mile
K_b =	0.0387	

where:

A =	1.59	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	8.67	
15	3.14	9.32	
30	2.11	10.84	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	5.73	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	5.73	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB174	Date:	10/15/07
Station:	6772+33.3 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.72	0.95	0.7
			0.0
			0.0
	0.72		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1017.64	Upstream elevation, feet
	1013.5	Downstream elevation, feet
L =	394	feet
L =	0.0746	miles
S =	55.480	feet/mile
K_b =	0.0409	

where:

A =	0.72	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.14
15	3.14	6.61
30	2.11	7.68

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.61**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.61**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB176		Date:	10/15/07
Station:	6771+88.3 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.12	0.95	0.1
			0.0
			0.0
	0.12		0.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1014.63	Upstream elevation, feet
	1013.51	Downstream elevation, feet
L =	159	feet
L =	0.0301	miles
S =	37.192	feet/mile
K_b =	0.0458	

where:

A =	0.12	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	4.69
15	3.14	5.04
30	2.11	5.86

***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.42**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.42**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB178	Date:	10/16/07
Station:	6772+62.93 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.62	0.95	0.6
			0.0
			0.0
	0.62		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1017.94	Upstream elevation, feet
	1013.56	Downstream elevation, feet
L =	352	feet
L =	0.0667	miles
S =	65.700	feet/mile
K_b =	0.0413	

where:

A =	0.62	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	5.54
15	3.14	5.96
30	2.11	6.93

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **2.25** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **2.25** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB180	Date:	10/15/07
Station:	6775+00 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.99	0.95	0.9
			0.0
			0.0
	0.99		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1019.11	Upstream elevation, feet
	1015.64	Downstream elevation, feet
L =	444	feet
L =	0.0841	miles
S =	41.265	feet/mile
K_b =	0.0400	

where:

A =	0.99	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.07	
15	3.14	7.60	
30	2.11	8.84	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.57	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.57	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB182	Date:	10/16/07
Station:	6775+00 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.08	0.95	1.0
			0.0
			0.0
	1.08		1.0

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.81	Upstream elevation, feet
	1015.56	Downstream elevation, feet
L =	432	feet
L =	0.0818	miles
S =	39.722	feet/mile
K_b =	0.0398	

where:

A =	1.08	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	7.04
15	3.14	7.56
30	2.11	8.80

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.91	cfs
Q_B =	0.00	cfs (upstream bypass flow)
Q_T =	3.91	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB188	Date:	10/15/07
Station:	6487+65.41 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.57	0.95	0.5
			0.0
			0.0
	0.57		0.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1019.38	Upstream elevation, feet
	1013.77	Downstream elevation, feet
L =	354	feet
L =	0.0670	miles
S =	83.675	feet/mile
K_b =	0.0415	

where:

A =	0.57	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.17	
15	3.14	5.56	
30	2.11	6.46	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	2.05	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	2.05	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB190	Date:	10/15/07
Station:	6790+73 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.70	0.95	0.7
			0.0
			0.0
	0.70		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.55	Upstream elevation, feet
	1007.47	Downstream elevation, feet
L =	408.6	feet
L =	0.0774	miles
S =	104.411	feet/mile
K_b =	0.0410	

where: A = 0.70 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	5.15
15	3.14	5.54
30	2.11	6.44

***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **2.52** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **2.52** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB192	Date:	12/12/07
Station:	6791+00 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.78	0.95	0.7
			0.0
			0.0
	0.78		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.82	Upstream elevation, feet
	1007.24	Downstream elevation, feet
L =	433.9	feet
L =	0.0822	miles
S =	104.407	feet/mile
K_b =	0.0407	

where:

A =	0.78	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.29	
15	3.14	5.68	
30	2.11	6.61	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	2.83	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	2.83	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB194	Date:	10/15/07
Station:	6790+73 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.43	0.95	1.4
			0.0
			0.0
	1.43		1.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1009.49	Upstream elevation, feet
	995.61	Downstream elevation, feet
L =	769.7	feet
L =	0.1458	miles
S =	95.214	feet/mile
K_b =	0.0390	

where:

A =	1.43	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.09	
15	3.14	7.62	
30	2.11	8.87	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	5.15	cfs
Q_B =	0.14	cfs (upstream bypass flow)
Q_T =	5.29	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB196		Date:	12/12/07
Station:	6797+39 I-10 WB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.37	0.95	1.3
			0.0
			0.0
	1.37		1.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1009.92	Upstream elevation, feet
	995.72	Downstream elevation, feet
L =	838.8	feet
L =	0.1589	miles
S =	89.385	feet/mile
K_b =	0.0391	

where:

A =	1.37	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.56	
15	3.14	8.13	
30	2.11	9.45	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.95**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.95**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB198		Date:	10/15/07
Station:	6800+50 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.01	0.95	1.0
			0.0
			0.0
	1.01		1.0

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	997.36	Upstream elevation, feet
	991.62	Downstream elevation, feet
L =	435	feet
L =	0.0824	miles
S =	69.672	feet/mile
K_b =	0.0400	

where: A = 1.01 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.95	
15	3.14	6.39	
30	2.11	7.44	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **3.64** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **3.64** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB200	Date:	10/15/07
Station:	6803+54.69 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.83	0.95	0.8
			0.0
			0.0
	0.83		0.8

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	993.94	Upstream elevation, feet
	989.77	Downstream elevation, feet
L =	419	feet
L =	0.0794	miles
S =	52.548	feet/mile
K_b =	0.0405	

where:

A =	0.83	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.41
15	3.14	6.90
30	2.11	8.02

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	2.98	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	2.98	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB202		Date:	10/16/07
Station:	6805+54.18 I-10 WB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	2.40	0.95	2.3
			0.0
			0.0
	2.40		2.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	997.47	Upstream elevation, feet
	989.51	Downstream elevation, feet
L =	960	feet
L =	0.1818	miles
S =	43.780	feet/mile
K_b =	0.0376	

where:

A =	2.40	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	9.89	
15	3.14	10.63	
30	2.11	12.36	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**8.66**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**8.66**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB204	Date:	10/16/07
Station:	6822+75.95 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.67	0.95	0.6
			0.0
			0.0
	0.67		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	996.29	Upstream elevation, feet
	993.3	Downstream elevation, feet
L =	367	feet
L =	0.0695	miles
S =	43.017	feet/mile
K_b =	0.0411	

where:

A =	0.67	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.44
15	3.14	6.92
30	2.11	8.05

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.40**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.40**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB206	Date:	10/16/07
Station:	6825+30 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.78	0.95	0.7
			0.0
			0.0
	0.78		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	998.07	Upstream elevation, feet
	994.03	Downstream elevation, feet
L =	390.5	feet
L =	0.0740	miles
S =	54.625	feet/mile
K_b =	0.0407	

where:

A =	0.78	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.13
15	3.14	6.59
30	2.11	7.67

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	2.80	cfs
Q_B =	0.00	cfs (upstream bypass flow)
Q_T =	2.80	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB208	Date:	10/6/07
Station:	6826+62.24 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.80	0.95	1.7
			0.0
			0.0
	1.80		1.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1004.78	Upstream elevation, feet
	995.03	Downstream elevation, feet
L =	770	feet
L =	0.1458	miles
S =	66.857	feet/mile
K_b =	0.0384	

where:

A =	1.80	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.85	
15	3.14	8.44	
30	2.11	9.81	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**6.51**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**6.51**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB210		Date:	10/16/07
Station:	6828+10 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.15	0.95	1.1
			0.0
			0.0
	1.15		1.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1002.54	Upstream elevation, feet
	995.64	Downstream elevation, feet
L =	480	feet
L =	0.0909	miles
S =	75.900	feet/mile
K_b =	0.0396	

where:

A =	1.15	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	6.05
15	3.14	6.51
30	2.11	7.57

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.15**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.15**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB212	Date:	10/16/07
Station:	6831+73.47 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.11	0.95	1.1
			0.0
			0.0
	1.11		1.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1011.74	Upstream elevation, feet
	1000.76	Downstream elevation, feet
L =	605	feet
L =	0.1146	miles
S =	95.825	feet/mile
K_b =	0.0397	

where:

A =	1.11	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.33	
15	3.14	6.81	
30	2.11	7.92	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.00**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.00**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB214	Date:	12/12/07
Station:	6832+75.11 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.85	0.95	0.8
			0.0
			0.0
	0.85		0.8

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1012.01	Upstream elevation, feet
	1003.04	Downstream elevation, feet
L =	503.9	feet
L =	0.0954	miles
S =	93.990	feet/mile
K_b =	0.0404	

where:

A =	0.85	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.87	
15	3.14	6.31	
30	2.11	7.34	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.08	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.08	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB216	Date:	10/16/07
Station:	6836+90 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.11	0.95	1.1
			0.0
			0.0
	1.11		1.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.06	Upstream elevation, feet
	1009.96	Downstream elevation, feet
L =	563	feet
L =	0.1066	miles
S =	47.829	feet/mile
K_b =	0.0397	

where:

A =	1.11	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.58	
15	3.14	8.15	
30	2.11	9.47	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**4.01**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**4.01**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB218	Date:	12/12/07
Station:	6836+90 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.04	0.95	1.0
			0.0
			0.0
	1.04		1.0

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.38	Upstream elevation, feet
	1010.23	Downstream elevation, feet
L =	564.5	feet
L =	0.1069	miles
S =	48.170	feet/mile
K_b =	0.0399	

where: A = 1.04 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	7.59
15	3.14	8.16
30	2.11	9.49

***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **3.77** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **3.77** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB220	Date:	12/12/07
Station:	6845+75 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.94	0.95	0.9
			0.0
			0.0
	0.94		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.06	Upstream elevation, feet
	1010.78	Downstream elevation, feet
L =	500	feet
L =	0.0947	miles
S =	45.197	feet/mile
K_b =	0.0402	

where:

A =	0.94	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.31	
15	3.14	7.86	
30	2.11	9.14	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.38	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.38	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB222	Date:	12/12/07
Station:	6845+85 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.93	0.95	0.9
			0.0
			0.0
	0.93		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.38	Upstream elevation, feet
	1010.98	Downstream elevation, feet
L =	520.5	feet
L =	0.0986	miles
S =	44.634	feet/mile
K_b =	0.0402	

where:

A =	0.93	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	7.49	
15	3.14	8.05	
30	2.11	9.36	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.37	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.37	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB224	Date:	12/12/07
Station:	6849+28 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.71	0.95	0.7
			0.0
			0.0
	0.71		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1012.76	Upstream elevation, feet
	1005.32	Downstream elevation, feet
L =	429	feet
L =	0.0813	miles
S =	91.569	feet/mile
K_b =	0.0409	

where:

A =	0.71	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.49	
15	3.14	5.91	
30	2.11	6.87	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.56**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.56**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB226	Date:	12/12/07
Station:	6849+67.64 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.82	0.95	0.8
			0.0
			0.0
	0.82		0.8

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1012.56	Upstream elevation, feet
	1004.65	Downstream elevation, feet
L =	481.6	feet
L =	0.0912	miles
S =	86.721	feet/mile
K_b =	0.0406	

where:

A =	0.82	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	5.89
15	3.14	6.33
30	2.11	7.37

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **2.94** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **2.94** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB227	Date:	2/14/08
Station:	6851+76.90 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.51	0.95	0.5
			0.0
			0.0
	0.51		0.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:
- T_c = the time of concentration, hours
- L = Length of the flow path, miles
- K_b = Representative watershed resistance coefficient
  m log A + b
- S = Watercourse slope, ft/mile
- I = the average rainfall intensity, inches/hour

input:

1007.11		Upstream elevation, feet
1001.48		Downstream elevation, feet
L =	338	feet
L =	0.0640	miles
S =	87.948	feet/mile
K_b =	0.0418	

where:

A =	0.51	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c
10	3.80	4.99
15	3.14	5.37
30	2.11	6.24

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
- Q = Peak flow, cfs
- C = weighted 'C' coefficient
- I = rainfall intensity
- A = area, acres

Q_R =	1.84	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	1.84	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB228		Date:	12/12/07
Station:	6852+80 I-10 EB			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.00	0.95	0.9
			0.0
			0.0
	1.00		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1006.43	Upstream elevation, feet
	999.81	Downstream elevation, feet
L =	404.4	feet
L =	0.0766	miles
S =	86.433	feet/mile
K_b =	0.0400	

where:

A =	1.00	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.37	
15	3.14	5.77	
30	2.11	6.71	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**3.60**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**3.60**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB230	Date:	2/14/08
Station:	6854+00 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.77	0.95	0.7
			0.0
			0.0
	0.77		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1003.26	Upstream elevation, feet
	998.35	Downstream elevation, feet
L =	330	feet
L =	0.0625	miles
S =	78.560	feet/mile
K_b =	0.0407	

where:

A =	0.77	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	5.04	
15	3.14	5.42	
30	2.11	6.30	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.76**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.76**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB232	Date:	12/12/07
Station:	6856+60.91 I-10 EB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.91	0.95	0.9
			0.0
			0.0
	0.91		0.9

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1002.07	Upstream elevation, feet
	997.24	Downstream elevation, feet
L =	494.1	feet
L =	0.0936	miles
S =	51.614	feet/mile
K_b =	0.0403	

where:

A =	0.91	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.98	
15	3.14	7.51	
30	2.11	8.73	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	3.29	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	3.29	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB234	Date:	2/14/08
Station:	6856+70.97 I-10 WB		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.72	0.95	0.7
			0.0
			0.0
	0.72		0.7

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1000.88	Upstream elevation, feet
	997.19	Downstream elevation, feet
L =	397	feet
L =	0.0752	miles
S =	49.076	feet/mile
K_b =	0.0409	

where:

A =	0.72	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

10-year:

Selected T_c	I	Computed T_c	
10	3.80	6.41	
15	3.14	6.89	
30	2.11	8.01	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.60**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.60**	**cfs (inflow)**

Estrella Parkway

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB302	Date:	10/17/07
Station:	Estrella Prkwy TI Ramp 'A' Sta 13+20		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.21	0.95	0.2
			0.0
			0.0
	0.21		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.4	Upstream elevation, feet
	1014.91	Downstream elevation, feet
L =	355.8	feet
L =	0.0674	miles
S =	51.791	feet/mile
K_b =	0.0442	

where:

A =	0.21	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	6.21	
15	3.14	6.68	
30	2.11	7.77	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.76**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.76**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB308	Date:	10/17/07
Station:	Estrella Prkwy TI Ramp 'A' Sta 16+81.2		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.28	0.95	0.3
			0.0
			0.0
	0.28		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.97	Upstream elevation, feet
	1006.18	Downstream elevation, feet
L =	389.2	feet
L =	0.0737	miles
S =	132.814	feet/mile
K_b =	0.0434	

where:

A =	0.28	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	4.81
15	3.14	5.17
30	2.11	6.01

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	1.01	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	1.01	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB312	Date:	10/17/07
Station:	Estrella Prkwy TI Ramp 'B' Sta 15+63		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.27	0.95	0.3
			0.0
			0.0
	0.27		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.94	Upstream elevation, feet
	1011.43	Downstream elevation, feet
L =	457	feet
L =	0.0866	miles
S =	52.107	feet/mile
K_b =	0.0436	

where:

A =	0.27	acres
m =	-0.00625	(Table 5.1)
b =	.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	6.97
15	3.14	7.50
30	2.11	8.72

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.97** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.97** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB316	Date:	11/2/07
Station:	Estrella Prkwy TI Ramp 'B' Sta 19+41.49		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.33	0.95	0.3
			0.0
			0.0
	0.33		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1011.87	Upstream elevation, feet
	1003.46	Downstream elevation, feet
L =	401	feet
L =	0.0759	miles
S =	110.735	feet/mile
K_b =	0.0430	

where: A = 0.33 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.14
15	3.14	5.52
30	2.11	6.42

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = 1.19 cfs
Q_B = 0.00 cfs (upstream bypass flow)
Q_T = 1.19 cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB320	Date:	1/18/08
Station:	Estrella Prkwy TI Ramp 'C' Sta 2+39.92		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.62	0.95	0.6
			0.0
			0.0
	0.62		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1015.14	Upstream elevation, feet
	1005.88	Downstream elevation, feet
L =	514	feet
L =	0.0973	miles
S =	95.122	feet/mile
K_b =	0.0413	

where:

A =	0.62	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	5.97	
15	3.14	6.42	
30	2.11	7.47	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.22**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.22**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB325	Date:	1/18/08
Station:	Estrella Prkwy TI Ramp 'C' Sta 7+00		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.28	0.95	0.3
			0.0
			0.0
	0.28		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.3	Upstream elevation, feet
	1014.06	Downstream elevation, feet
L =	274	feet
L =	0.0519	miles
S =	43.165	feet/mile
K_b =	0.0435	

where:

A =	0.28	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.72
15	3.14	6.15
30	2.11	7.15

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.00**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.00**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB326	Date:	10/17/07
Station:	Estrella Prkwy TI Rmp 'C' Sta 13+32		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.22	0.95	0.2
			0.0
			0.0
	0.22		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.3	Upstream elevation, feet
	1013.09	Downstream elevation, feet
L =	411	feet
L =	0.0778	miles
S =	41.238	feet/mile
K_b =	0.0441	

where:

A =	0.22	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	7.16	
15	3.14	7.70	
30	2.11	8.95	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.78**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.78**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB332	Date:	1/18/08
Station:	Estrella Prkwy TI Rmp 'D' Sta 2+59		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.31	0.95	0.3
			0.0
			0.0
	0.31		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1017.3	Upstream elevation, feet
	1006.25	Downstream elevation, feet
L =	421	feet
L =	0.0797	miles
S =	138.584	feet/mile
K_b =	0.0432	

where:

A =	0.31	acres
m =	-0.00625	(Table 5.1)
b =	.0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	4.92
15	3.14	5.29
30	2.11	6.15

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.12** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **1.12** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB337	Date:	1/18/08
Station:	Estrella Prkwy TI Rmp 'D' Sta 6+50		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.18	0.95	0.2
			0.0
			0.0
	0.18		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1019.04	Upstream elevation, feet
	1016.75	Downstream elevation, feet
L =	266	feet
L =	0.0504	miles
S =	45.456	feet/mile
K_b =	0.0446	

where:

A =	0.18	acres
m =	-0.00625	(Table 5.1)
b =	.0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.62
15	3.14	6.04
30	2.11	7.03

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.66**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.66**	**cfs (inflow)**

Estrella Parkway Infield Areas

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB302	Date:	10/17/07
Station:	Estrella Prkwy TI Ramp 'A' Sta 13+20		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual; Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.90	0.95	0.9
Infield Area	0.68	0.7	0.5
			0.0
	1.58		1.3

Weighted C-Coefficient: **0.84**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1021.16	Upstream elevation, feet
	1014.97	Downstream elevation, feet
L =	535	feet
L =	0.1013	miles
S =	61.090	feet/mile
K_b =	0.0388	

where:

A =	1.58	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	6.76
15	3.14	7.27
30	2.11	8.45

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**5.07**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**5.07**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB306	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'A' Sta 16+69.39		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.06	0.95	1.0
Infield Area	0.993	0.7	0.7
			0.0
	2.05		1.7

Weighted C-Coefficient: **0.83**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1024.64	Upstream elevation, feet
	1006.51	Downstream elevation, feet
L =	660	feet
L =	0.1250	miles
S =	145.040	feet/mile
K_b =	0.0380	

where: A = 2.05 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.69
15	3.14	6.11
30	2.11	7.11

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = 6.47 cfs
Q_B = 0.00 cfs (upstream bypass flow)
Q_T = 6.47 cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB310	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'B' Sta 15+63		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.16	0.95	1.1
Infield Area	1	0.7	0.7
			0.0
	2.16		1.8

Weighted C-Coefficient: **0.83**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.75	Upstream elevation, feet
	1011.37	Downstream elevation, feet
L =	700	feet
L =	0.1326	miles
S =	55.666	feet/mile
K_b =	0.0379	

where:

A =	2.16	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	7.87
15	3.14	8.46
30	2.11	9.84

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**6.84**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**6.84**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB314	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'B' Sta 19+41.49		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.12	0.95	1.1
Infield Area	1.114	0.7	0.8
			0.0
	2.23		1.8

Weighted C-Coefficient: **0.83**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1025.3	Upstream elevation, feet
	1003.68	Downstream elevation, feet
L =	550	feet
L =	0.1042	miles
S =	207.552	feet/mile
K_b =	0.0378	

where:

A =	2.23	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	4.63	
15	3.14	4.98	
30	2.11	5.79	***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	6.99	cfs
Q_B =	0.00	cfs (upstream bypass flow)
Q_T =	6.99	cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB318	Date:	12/7/07
Station:	Estrella Prkwy TI Ramp 'C' Sta 2+39.92		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.47	0.95	0.4
Infield Area	1.25	0.7	0.9
			0.0
	1.71		1.3

Weighted C-Coefficient: **0.77**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1024.72	Upstream elevation, feet
	1006.46	Downstream elevation, feet
L =	615	feet
L =	0.1165	miles
S =	156.769	feet/mile
K_b =	0.0385	

where: A = 1.71 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
14	3.80	5.40	
15	3.14	5.80	
30	2.11	6.75	***Use 14 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **4.99** cfs
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **4.99** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB324	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'C' Sta 7+00		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.26	0.95	1.2
Infield Area	0.98	0.7	0.7
			0.0
	2.25		1.9

Weighted C-Coefficient: **0.84**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1016.35	Upstream elevation, feet
	1014.65	Downstream elevation, feet
L =	760	feet
L =	0.1439	miles
S =	11.811	feet/mile
K_b =	0.0378	

where:

A =	2.25	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
14	3.27	14.01	
15	3.14	14.23	
30	1.31	19.84	***Use 14 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	6.17	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	6.17	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB330	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'D' Sta 2.59		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	1.15	0.95	1.1
Infield Area	1.00	0.7	0.7
			0.0
	2.16		1.8

Weighted C-Coefficient: **0.83**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1024.8	Upstream elevation, feet
	1006.64	Downstream elevation, feet
L =	490	feet
L =	0.0928	miles
S =	195.683	feet/mile
K_b =	0.0379	

where:

A =	2.16	acres
m =	-0.00625	(Table 5.1)
b =	'0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
14	3.80	4.46
15	3.14	4.79
30	2.11	5.57

***Use 14 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**6.83**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**6.83**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB336	Date:	12/6/07
Station:	Estrella Prkwy TI Ramp 'D' Sta 6+50		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual; Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.91	0.95	0.9
Infield Area	0.58	0.7	0.4
			0.0
	1.50		1.3

Weighted C-Coefficient: **0.85**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1024.45	Upstream elevation, feet
	1016.8	Downstream elevation, feet
L =	565	feet
L =	0.1070	miles
S =	71.490	feet/mile
K_b =	0.0389	

where:

A =	1.50	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
14	3.80	6.63	
15	3.14	7.13	
30	2.11	8.29	***Use 14 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	4.84	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	4.84	**cfs (inflow)**

Bullard Avenue

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB400	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'A' Sta 6+68.25		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.21	0.95	0.2
			0.0
			0.0
	0.21		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1012.95	Upstream elevation, feet
	1009.87	Downstream elevation, feet
L =	308	feet
L =	0.0583	miles
S =	52.800	feet/mile
K_b =	0.0443	

where:

A =	0.21	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.75
15	3.74	5.78
30	3.72	5.80

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.75** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.75** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB402	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'A' Sta 17+70		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.59	0.95	0.6
			0.0
			0.0
	0.59		0.6

Weighted C-Coefficient: **0.95**

Time of Concentration:

$$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1012.95	Upstream elevation, feet
	997.2	Downstream elevation, feet
L =	850	feet
L =	0.1610	miles
S =	97.835	feet/mile
K_b =	0.0415	

where: A = 0.59 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	7.62	
15	3.74	7.67	
30	3.72	7.69	***Use 10 minutes**

Rational Method:

$$Q = CiA$$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = 2.11 cfs
Q_B = 0.00 cfs (upstream bypass flow)
Q_T = 2.11 cfs (inflow)

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB404	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'B' Sta 12+35		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.27	0.95	0.3
			0.0
			0.0
	0.27		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1009.31	Upstream elevation, feet
	1003.21	Downstream elevation, feet
L =	450	feet
L =	0.0852	miles
S =	71.573	feet/mile
K_b =	0.0435	

where:

A =	0.27	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	6.27	
15	3.74	6.31	
30	3.72	6.32	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.98**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.98**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB406	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'B' Sta 13+25.2		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.14	0.95	0.1
			0.0
			0.0
	0.14		0.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1003.21	Upstream elevation, feet
	1001.64	Downstream elevation, feet
L =	160	feet
L =	0.0303	miles
S =	51.810	feet/mile
K_b =	0.0453	

where: A = 0.14 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	4.22
15	3.74	4.24
30	3.72	4.25

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.51** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.51** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB408	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'C' Sta 7+20		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.23	0.95	0.2
			0.0
			0.0
	0.23		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1007.38	Upstream elevation, feet
	1003.28	Downstream elevation, feet
L =	400	feet
L =	0.0758	miles
S =	54.120	feet/mile
K_b =	0.0439	

where:

A =	0.23	acres
m =	-0.00625	(Table 5.1)
b =	.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	6.48
15	3.74	6.52
30	3.72	6.53

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**0.85**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**0.85**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB410	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'C' Sta 13+25		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.15	0.95	0.1
			0.0
			0.0
	0.15		0.1

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1007.38	Upstream elevation, feet
	1002.8	Downstream elevation, feet
L =	250	feet
L =	0.0473	miles
S =	96.730	feet/mile
K_b =	0.0452	

where: A = 0.15 acres
m = -0.00625 (Table 5.1)
b = .0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	4.34	
15	3.74	4.37	
30	3.72	4.38	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.52** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.52** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB412	Date:	10/16/07
Station:	Bullard Ave TI Ramp 'D' Sta 8+17		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.29	0.95	0.3
			0.0
			0.0
	0.29		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1006.49	Upstream elevation, feet
	1001.99	Downstream elevation, feet
L =	433	feet
L =	0.0820	miles
S =	54.873	feet/mile
K_b =	0.0434	

where:

A =	0.29	acres
m =	-0.00625	(Table 5.1)
b =	.0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	6.67	
15	3.74	6.71	
30	3.72	6.72	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.04**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.04**	**cfs (inflow)**

Litchfield Road

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB400	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'A' Sta 10+00		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.20	0.95	0.2
			0.0
			0.0
	0.20		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.74	Upstream elevation, feet
	1014.99	Downstream elevation, feet
L =	302	feet
L =	0.0572	miles
S =	65.563	feet/mile
K_b =	0.0444	

where: A = 0.20 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	5.33
15	3.74	5.37
30	3.72	5.38

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.71** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.71** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB402	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'A' Sta 14+88		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.36	0.95	0.3
			0.0
			0.0
	0.36		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

1015.59		Upstream elevation, feet
994.84		Downstream elevation, feet
L = 520		feet
L = 0.0985		miles
S = 210.692		feet/mile
K_b = 0.0428		

where: A = 0.36 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	4.78
15	3.74	4.81
30	3.72	4.82

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.28** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **1.28** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB404	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'B' Sta 14+00		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.43	0.95	0.4
			0.0
			0.0
	0.43		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1019.11	Upstream elevation, feet
	1008.93	Downstream elevation, feet
L =	715	feet
L =	0.1354	miles
S =	75.175	feet/mile
K_b =	0.0423	

where:

A =	0.43	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	7.67
15	3.74	7.71
30	3.72	7.73

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.55**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.55**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB406	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'B' Sta 18+78		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.41	0.95	0.4
			0.0
			0.0
	0.41		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1018.74	Upstream elevation, feet
	994.84	Downstream elevation, feet
L =	793	feet
L =	0.1502	miles
S =	159.132	feet/mile
K_b =	0.0424	

where:

A =	0.41	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	6.41
15	3.74	6.45
30	3.72	6.46

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.46** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **1.46** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB408	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'C' Sta 2+62		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.36	0.95	0.3
			0.0
			0.0
	0.36		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	991.8	Upstream elevation, feet
	987.09	Downstream elevation, feet
L =	352	feet
L =	0.0667	miles
S =	70.650	feet/mile
K_b =	0.0428	

where: A = 0.36 acres
m = -0.00625 (Table 5.1)
b = 0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	5.52	
15	3.74	5.55	
30	3.72	5.56	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.31** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **1.31** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB410	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'C' Sta 5+60		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.28	0.95	0.3
			0.0
			0.0
	0.28		0.3

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	991.8	Upstream elevation, feet
	990.72	Downstream elevation, feet
L =	351	feet
L =	0.0665	miles
S =	16.246	feet/mile
K_b =	0.0435	

where: A = 0.28 acres
m = -0.00625 (Table 5.1)
b = .0.04 (Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	8.76	
15	3.74	8.82	
30	3.72	8.83	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **1.00** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **1.00** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB412	Date:	10/17/07
Station:	Litchfield Rd TI Ramp 'D' Sta 2+36.15		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.47	0.95	0.4
			0.0
			0.0
	0.47		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	944.72	Upstream elevation, feet
	98.75	Downstream elevation, feet
L =	662	feet
L =	0.1254	miles
S =	6747.314	feet/mile
K_b =	0.0420	

where:

A =	0.47	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	1.82
15	3.74	1.84
30	3.72	1.84

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	1.71	**cfs**
Q_B =	0.00	**cfs (upstream bypass flow)**
Q_T =	1.71	**cfs (inflow)**

Dysart Road

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB600	Date:	2/18/08
Station:	Dysart Rd TI Ramp 'A' Sta 14+34		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.47	0.95	0.4
			0.0
			0.0
	0.47		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1002.04	Upstream elevation, feet
	990.74	Downstream elevation, feet
L =	678	feet
L =	0.1284	miles
S =	88.000	feet/mile
K_b =	0.0421	

where:

A =	0.47	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	7.09
15	3.74	7.13
30	3.72	7.15

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:

Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.70**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.70**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening		Design:	DNJ
Design Storm:	10	years	Check:	
Catch Basin No.:	CB		Date:	10/17/07
Station:	Dysart Rd TI Ramp 'B' Sta 18+43			

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.57	0.95	0.5
			0.0
			0.0
	0.57		0.5

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	999.45	Upstream elevation, feet
	989.37	Downstream elevation, feet
L =	801	feet
L =	0.1517	miles
S =	66.445	feet/mile
K_b =	0.0415	

where:

A =	0.57	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	8.35	
15	3.74	8.40	
30	3.72	8.42	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**2.04**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**2.04**	**cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB604	Date:	2/14/08
Station:	Dysart Rd TI Ramp 'C' Sta 6+87		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.25	0.95	0.2
			0.0
			0.0
	0.25		0.2

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	995.98	Upstream elevation, feet
	995.2	Downstream elevation, feet
L =	366	feet
L =	0.0693	miles
S =	11.252	feet/mile
K_b =	0.0438	

where:

A =	0.25	acres
m =	-0.00625	(Table 5.1)
b =	.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c
10	3.80	10.06
15	3.74	10.12
30	3.72	10.14

***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R = **0.90** **cfs**
Q_B = **0.00** **cfs (upstream bypass flow)**
Q_T = **0.90** **cfs (inflow)**

I-10 Outside Widening, Sarival Avenue to Dysart Road
Rational Method

Project Information:

Project Name:	I-10 Outside Widening	Design:	DNJ
Design Storm:	10 years	Check:	
Catch Basin No.:	CB606	Date:	10/17/07
Station:	Dysart Rd TI Ramp 'D' Sta 3+02		

Computations in accordance with the Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, 1991.

Weighted C-Coefficient:

Land Use	Area (acres)	C	Area x C
Pavement	0.40	0.95	0.4
			0.0
			0.0
	0.40		0.4

Weighted C-Coefficient: **0.95**

Time of Concentration:

$Tc = 11.4L^{0.50} K_b^{0.52} S^{-0.31} i^{-0.38}$ *(equation 5.5)*

where:

T_c = the time of concentration, hours
L = Length of the flow path, miles
K_b = Representative watershed resistance coefficient
m log A + b
S = Watercourse slope, ft/mile
I = the average rainfall intensity, inches/hour

input:

	1003.63	Upstream elevation, feet
	992.75	Downstream elevation, feet
L =	582	feet
L =	0.1102	miles
S =	98.705	feet/mile
K_b =	0.0425	

where:

A =	0.40	acres
m =	-0.00625	(Table 5.1)
b =	0.04	(Table 5.1)

Computations:

2-year:

Selected T_c	I	Computed T_c	
10	3.80	6.37	
15	3.74	6.41	
30	3.72	6.43	***Use 10 minutes**

Rational Method:

$Q = CiA$ *(equation 3.1)*

Where:
Q = Peak flow, cfs
C = weighted 'C' coefficient
I = rainfall intensity
A = area, acres

Q_R =	**1.44**	**cfs**
Q_B =	**0.00**	**cfs (upstream bypass flow)**
Q_T =	**1.44**	**cfs (inflow)**

Catch Basin Analyses

I-10 EB & WB

Worksheet for Slotted Drain Inlet On Grade CB100 Sta 6665+75 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.44	ft³/s
Slope	0.00170	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.44	ft³/s
Bypass Flow	0.00	ft³/s
Spread	13.36	ft
Depth	0.27	ft
Flow Area	1.78	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	1.37	ft/s
Equivalent Cross Slope	0.03415	ft/ft
Length Factor	1.06	
Total Interception Length	12.65	ft

Worksheet for Slotted Drain Inlet On Grade CB102 Sta 6667+48.52 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.17	ft^3/s
Slope	0.00570	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	96.86	%
Intercepted Flow	3.07	ft^3/s
Bypass Flow	0.10	ft^3/s
Spread	11.75	ft
Depth	0.24	ft
Flow Area	1.38	ft^2
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.29	ft/s
Equivalent Cross Slope	0.03617	ft/ft
Length Factor	0.85	
Total Interception Length	19.62	ft

Worksheet for Slotted Drain Inlet On Grade CB104 Sta 6667+80 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.44	ft³/s
Slope	0.00590	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.79	%
Intercepted Flow	3.43	ft³/s
Bypass Flow	0.01	ft³/s
Spread	12.03	ft
Depth	0.24	ft
Flow Area	1.45	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.38	ft/s
Equivalent Cross Slope	0.03542	ft/ft
Length Factor	0.97	
Total Interception Length	20.77	ft

Worksheet for Slotted Drain Inlet On Grade CB106 Sta 6670+20 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.77	ft³/s
Slope	0.01100	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.77	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.10	ft
Depth	0.24	ft
Flow Area	1.46	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.26	ft/s
Equivalent Cross Slope	0.03535	ft/ft
Length Factor	1.05	
Total Interception Length	28.76	ft

Worksheet for Slotted Drain Inlet On Grade CB108 Sta 6670+50 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.30	ft³/s
Slope	0.01150	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft — 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.99	%
Intercepted Flow	2.30	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.13	ft
Depth	0.18	ft
Flow Area	0.83	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.76	ft/s
Equivalent Cross Slope	0.03914	ft/ft
Length Factor	1.00	
Total Interception Length	20.19	ft

Worksheet for Slotted Drain Inlet On Grade CB114 Sta 6678+83 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	1.98	ft³/s
Slope	0.00552	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	97.30	%
Intercepted Flow	1.93	ft³/s
Bypass Flow	0.05	ft³/s
Spread	9.90	ft
Depth	0.20	ft
Flow Area	0.98	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.02	ft/s
Equivalent Cross Slope	0.03799	ft/ft
Length Factor	0.87	
Total Interception Length	15.48	ft

Worksheet for Slotted Drain Inlet On Grade CB116 Sta 6686+92 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	1.95	ft³/s
Slope	0.00600	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	96.85	%
Intercepted Flow	1.89	ft³/s
Bypass Flow	0.06	ft³/s
Spread	9.69	ft
Depth	0.19	ft
Flow Area	0.94	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.08	ft/s
Equivalent Cross Slope	0.03829	ft/ft
Length Factor	0.85	
Total Interception Length	15.70	ft

Worksheet for Slotted Drain Inlet On Grade CB120 Sta 6695+75 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.46	ft³/s
Slope	0.01840	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.64	%
Intercepted Flow	4.44	ft³/s
Bypass Flow	0.02	ft³/s
Spread	10.72	ft
Depth	0.22	ft
Flow Area	1.15	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.88	ft/s
Equivalent Cross Slope	0.03740	ft/ft
Length Factor	0.96	
Total Interception Length	31.54	ft

Worksheet for Slotted Drain Inlet On Grade CB122 Sta 6699+75 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	5.52	ft³/s
Slope	0.01600	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	33.50	ft ← 50' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.93	%
Intercepted Flow	5.52	ft³/s
Bypass Flow	0.00	ft³/s
Spread	11.91	ft
Depth	0.24	ft
Flow Area	1.42	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.89	ft/s
Equivalent Cross Slope	0.03555	ft/ft
Length Factor	0.98	
Total Interception Length	34.11	ft

Worksheet for Slotted Drain Inlet On Grade CB124 Sta 6700+14 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	5.18	ft³/s
Slope	0.01560	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.90	%
Intercepted Flow	5.12	ft³/s
Bypass Flow	0.06	ft³/s
Spread	11.69	ft
Depth	0.23	ft
Flow Area	1.37	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.79	ft/s
Equivalent Cross Slope	0.03579	ft/ft
Length Factor	0.92	
Total Interception Length	32.82	ft

Worksheet for Slotted Drain Inlet On Grade CB126 Sta 6706+87.53 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	7.44	ft³/s
Slope	0.00540	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	7.44	ft³/s
Bypass Flow	0.00	ft³/s
Spread	16.33	ft
Depth	0.33	ft
Flow Area	2.67	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.79	ft/s
Equivalent Cross Slope	0.03193	ft/ft
Length Factor	1.01	
Total Interception Length	29.77	ft

Worksheet for Slotted Drain Inlet On Grade CB128 Sta 6707+21.18 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	7.48	ft³/s
Slope	0.00480	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	7.48	ft³/s
Bypass Flow	0.00	ft³/s
Spread	16.73	ft
Depth	0.33	ft
Flow Area	2.80	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.67	ft/s
Equivalent Cross Slope	0.03168	ft/ft
Length Factor	1.04	
Total Interception Length	28.93	ft

Worksheet for Slotted Drain Inlet In Sag CB130 Sta 6710+40.25 I-10 EB (EAST END)

Project Description

Solve For	Spread

Input Data

Discharge	5.09	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Slot Width	0.15	ft
Slot Length	15.00	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	9.11	ft
Depth	0.18	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	2.19	ft²

Worksheet for Slotted Drain Inlet In Sag CB130 Sta 6710+40.25 I-10 EB (WEST EN

Project Description

Solve For	Spread

Input Data

Discharge	1.62	ft^3/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Slot Width	0.15	ft
Slot Length	5.00	ft ← 10' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	8.71	ft
Depth	0.17	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	0.73	ft^2

Worksheet for Slotted Drain Inlet In Sag CB132 Sta 6710+49.64 I-10 EB (EAST END)

Project Description

Solve For	Spread

Input Data

Discharge	2.18	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Slot Width	0.15	ft
Slot Length	7.50	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	7.81	ft
Depth	0.16	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	1.09	ft²

Worksheet for Slotted Drain Inlet In Sag CB132 Sta 6710+49.64 I-10 EB (WEST EL

Project Description

Solve For	Spread

Input Data

Discharge	3.72	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Slot Width	0.15	ft
Slot Length	10.00	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	9.95	ft
Depth	0.20	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	1.46	ft²

Worksheet for Slotted Drain Inlet In Sag CB136 Sta 6715+80 I-10 EB (EAST END)

Project Description

Solve For	Spread

Input Data

Discharge	3.47	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.04	ft/ft
Slot Width	0.15	ft
Slot Length	15.00	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	5.56	ft
Depth	0.12	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	2.19	ft²

Worksheet for Slotted Drain Inlet In Sag CB136 Sta 6715+80 I-10 EB (WEST I-10)

Project Description

Solve For	Spread

Input Data

Discharge	1.27	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.04	ft/ft
Slot Width	0.15	ft
Slot Length	5.00	ft ← 10' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	3.48	ft
Depth	0.14	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	0.73	ft²

Worksheet for Slotted Drain Inlet On Grade CB138 Sta 6719+10 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.53	ft³/s
Slope	0.01300	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.53	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.31	ft
Depth	0.28	ft
Flow Area	0.90	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.94	ft/s
Equivalent Cross Slope	0.06965	ft/ft
Length Factor	1.13	
Total Interception Length	17.74	ft

Worksheet for Slotted Drain Inlet On Grade CB140 Sta 6722+40 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.44	ft^3/s
Slope	0.01542	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.44	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	6.05	ft
Depth	0.27	ft
Flow Area	0.82	ft^2
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	4.17	ft/s
Equivalent Cross Slope	0.07028	ft/ft
Length Factor	1.09	
Total Interception Length	18.37	ft

Worksheet for Slotted Drain Inlet On Grade CB148 Sta 6725+12.15 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.44	ft³/s
Slope	0.01524	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.44	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.81	ft
Depth	0.33	ft
Flow Area	0.99	ft²
Gutter Depression	0.07	ft
Total Depression	0.15	ft
Velocity	4.48	ft/s
Equivalent Cross Slope	0.08510	ft/ft
Length Factor	1.11	
Total Interception Length	18.17	ft

Worksheet for Slotted Drain Inlet On Grade CB152 Sta 6729+65 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.21	ft³/s
Slope	0.00790	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.04	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.21	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.09	ft
Depth	0.32	ft
Flow Area	1.28	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.30	ft/s
Equivalent Cross Slope	0.05989	ft/ft
Length Factor	1.12	
Total Interception Length	18.01	ft

Worksheet for Slotted Drain Inlet On Grade CB154 Sta 6740+30 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.82	ft³/s
Slope	0.00920	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.83	%
Intercepted Flow	4.81	ft³/s
Bypass Flow	0.01	ft³/s
Spread	12.56	ft
Depth	0.25	ft
Flow Area	1.58	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.06	ft/s
Equivalent Cross Slope	0.03489	ft/ft
Length Factor	0.97	
Total Interception Length	27.60	ft

Worksheet for Slotted Drain Inlet On Grade CB156 Sta 6740+30 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.87	ft³/s
Slope	0.00860	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.94	%
Intercepted Flow	4.87	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.77	ft
Depth	0.26	ft
Flow Area	1.63	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.99	ft/s
Equivalent Cross Slope	0.03469	ft/ft
Length Factor	0.98	
Total Interception Length	27.26	ft

Worksheet for Slotted Drain Inlet On Grade CB158 Sta 6746+09 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	9.50	ft^3/s
Slope	0.01867	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	85.06	%
Intercepted Flow	8.08	ft^3/s
Bypass Flow	1.42	ft^3/s
Spread	14.20	ft
Depth	0.29	ft
Flow Area	2.02	ft^2
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	4.71	ft/s
Equivalent Cross Slope	0.03383	ft/ft
Length Factor	0.65	
Total Interception Length	46.23	ft

Worksheet for Slotted Drain Inlet On Grade CB160 Sta 6747+48 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	1.30	ft^3/s
Slope	0.01770	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.00	ft/ft
Road Cross Slope	0.00	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	97.46	%
Intercepted Flow	1.27	ft^3/s
Bypass Flow	0.03	ft^3/s
Spread	17.03	ft
Depth	0.08	ft
Flow Area	0.67	ft^2
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	1.95	ft/s
Equivalent Cross Slope	0.01610	ft/ft
Length Factor	0.87	
Total Interception Length	30.80	ft

Worksheet for Slotted Drain Inlet On Grade CB162 Sta 6746+89.67 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	7.28	ft³/s
Slope	0.01708	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.96	%
Intercepted Flow	7.28	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.08	ft
Depth	0.36	ft
Flow Area	1.61	ft²
Gutter Depression	0.12	ft
Total Depression	0.20	ft
Velocity	4.54	ft/s
Equivalent Cross Slope	0.06512	ft/ft
Length Factor	0.99	
Total Interception Length	27.17	ft

Worksheet for Slotted Drain Inlet On Grade CB164 Sta 6751+25 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.65	ft³/s
Slope	0.00950	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.65	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.68	ft
Depth	0.37	ft
Flow Area	1.24	ft²
Gutter Depression	0.07	ft
Total Depression	0.15	ft
Velocity	3.76	ft/s
Equivalent Cross Slope	0.08169	ft/ft
Length Factor	1.02	
Total Interception Length	16.47	ft

Worksheet for Slotted Drain Inlet In Sag CB166 Sta 6754+87.55 I-10 WB

Project Description

Solve For	Spread

Input Data

Discharge	3.49	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.04	ft/ft
Road Cross Slope	0.04	ft/ft
Slot Width	0.15	ft
Slot Length	7.50	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	6.27	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	1.09	ft²

Worksheet for Slotted Drain Inlet In Sag CB168 Sta 6755+09.39 I-10 WB

Project Description

Solve For	Spread

Input Data

Discharge	4.06	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.04	ft/ft
Road Cross Slope	0.04	ft/ft
Slot Width	0.15	ft
Slot Length	7.50	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	7.16	ft
Depth	0.28	ft
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Open Slot Area	1.09	ft²

Worksheet for Slotted Drain Inlet On Grade CB170 Sta 6759+81.32 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	5.13	ft³/s
Slope	0.00909	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.04	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.89	%
Intercepted Flow	5.12	ft³/s
Bypass Flow	0.01	ft³/s
Spread	8.49	ft
Depth	0.33	ft
Flow Area	1.41	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.65	ft/s
Equivalent Cross Slope	0.05919	ft/ft
Length Factor	0.98	
Total Interception Length	20.56	ft

Worksheet for Slotted Drain Inlet On Grade CB172 Sta 6765+70.12 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	5.73	ft³/s
Slope	0.00909	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.04	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	5.73	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.85	ft
Depth	0.35	ft
Flow Area	1.53	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.75	ft/s
Equivalent Cross Slope	0.05858	ft/ft
Length Factor	1.08	
Total Interception Length	21.67	ft

Worksheet for Slotted Drain Inlet On Grade CB174 Sta 6772+33.3 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.61	ft³/s
Slope	0.00922	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.01	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.73	%
Intercepted Flow	2.60	ft³/s
Bypass Flow	0.01	ft³/s
Spread	15.48	ft
Depth	0.15	ft
Flow Area	1.19	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.20	ft/s
Equivalent Cross Slope	0.02239	ft/ft
Length Factor	0.96	
Total Interception Length	27.85	ft

Worksheet for Slotted Drain Inlet On Grade CB176 Sta 6771+88.3 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	0.42	ft³/s
Slope	0.00922	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.00	ft/ft
Road Cross Slope	0.00	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	95.44	%
Intercepted Flow	0.40	ft³/s
Bypass Flow	0.02	ft³/s
Spread	16.12	ft
Depth	0.05	ft
Flow Area	0.40	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	1.04	ft/s
Equivalent Cross Slope	0.01516	ft/ft
Length Factor	0.82	
Total Interception Length	16.34	ft

Worksheet for Slotted Drain Inlet On Grade CB178 Sta 6772+62.93 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.25	ft³/s
Slope	0.00909	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.17	%
Intercepted Flow	2.21	ft³/s
Bypass Flow	0.04	ft³/s
Spread	9.46	ft
Depth	0.19	ft
Flow Area	0.89	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.51	ft/s
Equivalent Cross Slope	0.03863	ft/ft
Length Factor	0.89	
Total Interception Length	18.79	ft

Worksheet for Slotted Drain Inlet On Grade CB180 Sta 6775+00 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.57	ft³/s
Slope	0.00922	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.96	%
Intercepted Flow	3.57	ft³/s
Bypass Flow	0.00	ft³/s
Spread	11.22	ft
Depth	0.22	ft
Flow Area	1.26	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.84	ft/s
Equivalent Cross Slope	0.03632	ft/ft
Length Factor	0.99	
Total Interception Length	23.77	ft

Worksheet for Slotted Drain Inlet On Grade CB182 Sta 6775+00 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.91	ft³/s
Slope	0.00909	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.48	%
Intercepted Flow	3.89	ft³/s
Bypass Flow	0.02	ft³/s
Spread	11.64	ft
Depth	0.23	ft
Flow Area	1.35	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.89	ft/s
Equivalent Cross Slope	0.03584	ft/ft
Length Factor	0.95	
Total Interception Length	24.78	ft

Worksheet for Slotted Drain Inlet On Grade CB188 Sta 6787+65.41 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.05	ft³/s
Slope	0.01810	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.33	%
Intercepted Flow	2.04	ft³/s
Bypass Flow	0.01	ft³/s
Spread	8.03	ft
Depth	0.16	ft
Flow Area	0.64	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.18	ft/s
Equivalent Cross Slope	0.04101	ft/ft
Length Factor	0.94	
Total Interception Length	21.43	ft

Worksheet for Slotted Drain Inlet On Grade CB190 Sta 6790+73 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.52	ft^3/s
Slope	0.01994	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	76.68	%
Intercepted Flow	1.93	ft^3/s
Bypass Flow	0.59	ft^3/s
Spread	8.52	ft
Depth	0.17	ft
Flow Area	0.73	ft^2
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.46	ft/s
Equivalent Cross Slope	0.04072	ft/ft
Length Factor	0.55	
Total Interception Length	24.16	ft

Worksheet for Slotted Drain Inlet On Grade CB192 Sta 6791+00 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.83	ft³/s
Slope	0.01990	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.84	%
Intercepted Flow	2.80	ft³/s
Bypass Flow	0.03	ft³/s
Spread	8.90	ft
Depth	0.18	ft
Flow Area	0.79	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.56	ft/s
Equivalent Cross Slope	0.04006	ft/ft
Length Factor	0.92	
Total Interception Length	25.60	ft

Worksheet for Slotted Drain Inlet On Grade CB194 Sta 6797+41.71 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	5.29	ft³/s
Slope	0.01380	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	33.50	ft — 50' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	5.29	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.06	ft
Depth	0.24	ft
Flow Area	1.46	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.63	ft/s
Equivalent Cross Slope	0.03583	ft/ft
Length Factor	1.05	
Total Interception Length	31.90	ft

Worksheet for Slotted Drain Inlet On Grade CB196 Sta 6797+39 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.95	ft³/s
Slope	0.01410	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.84	%
Intercepted Flow	4.94	ft³/s
Bypass Flow	0.01	ft³/s
Spread	11.71	ft
Depth	0.24	ft
Flow Area	1.37	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.60	ft/s
Equivalent Cross Slope	0.03621	ft/ft
Length Factor	0.97	
Total Interception Length	31.02	ft

Worksheet for Slotted Drain Inlet On Grade CB198 Sta 6800+50 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.64	ft³/s
Slope	0.00870	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.64	ft³/s
Bypass Flow	0.00	ft³/s
Spread	11.43	ft
Depth	0.23	ft
Flow Area	1.31	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.78	ft/s
Equivalent Cross Slope	0.03653	ft/ft
Length Factor	1.00	
Total Interception Length	23.46	ft

Worksheet for Slotted Drain Inlet On Grade CB200 Sta 6803+54.69 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.98	ft³/s
Slope	0.00380	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.90	%
Intercepted Flow	2.98	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.39	ft
Depth	0.25	ft
Flow Area	1.54	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	1.94	ft/s
Equivalent Cross Slope	0.03549	ft/ft
Length Factor	0.98	
Total Interception Length	17.12	ft

Worksheet for Slotted Drain Inlet In Sag CB202 Sta 6805+54.18 I-10 WB

Project Description

Solve For	Spread

Input Data

Discharge	8.66	ft³/s
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Slot Width	0.15	ft
Slot Length	20.00	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Spread	11.35	ft
Depth	0.23	ft
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Open Slot Area	2.92	ft²

Worksheet for Slotted Drain Inlet On Grade CB204 Sta 6822+75.95 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.40	ft³/s
Slope	0.00251	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.40	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.34	ft
Depth	0.25	ft
Flow Area	1.53	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	1.57	ft/s
Equivalent Cross Slope	0.03553	ft/ft
Length Factor	1.70	
Total Interception Length	13.79	ft

Worksheet for Slotted Drain Inlet On Grade CB206 Sta 6825+30 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.80	ft³/s
Slope	0.00380	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.80	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.10	ft
Depth	0.24	ft
Flow Area	1.47	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	1.91	ft/s
Equivalent Cross Slope	0.03579	ft/ft
Length Factor	1.41	
Total Interception Length	16.59	ft

Worksheet for Slotted Drain Inlet On Grade CB208 Sta 6826+62.24 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	6.51	ft³/s
Slope	0.00640	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	30.15	ft ← 45° SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	6.51	ft³/s
Bypass Flow	0.00	ft³/s
Spread	15.05	ft
Depth	0.30	ft
Flow Area	2.26	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.87	ft/s
Equivalent Cross Slope	0.03280	ft/ft
Length Factor	1.03	
Total Interception Length	29.14	ft

Worksheet for Slotted Drain Inlet On Grade CB210 Sta 6828+10 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.15	ft³/s
Slope	0.00890	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.17	%
Intercepted Flow	4.12	ft³/s
Bypass Flow	0.03	ft³/s
Spread	11.95	ft
Depth	0.24	ft
Flow Area	1.43	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.90	ft/s
Equivalent Cross Slope	0.03594	ft/ft
Length Factor	0.93	
Total Interception Length	25.21	ft

Worksheet for Slotted Drain Inlet On Grade CB212 Sta 6831+73.47 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.00	ft³/s
Slope	0.01560	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.30	%
Intercepted Flow	3.97	ft³/s
Bypass Flow	0.03	ft³/s
Spread	10.61	ft
Depth	0.21	ft
Flow Area	1.13	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.55	ft/s
Equivalent Cross Slope	0.03754	ft/ft
Length Factor	0.94	
Total Interception Length	28.61	ft

Worksheet for Slotted Drain Inlet On Grade CB214 Sta 6832+75.11 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.08	ft³/s
Slope	0.01789	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.70	ft ← 40' SLOTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.08	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.37	ft
Depth	0.19	ft
Flow Area	0.88	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.50	ft/s
Equivalent Cross Slope	0.03930	ft/ft
Length Factor	1.03	
Total Interception Length	25.99	ft

Worksheet for Slotted Drain Inlet On Grade CB216 Sta 6836+90 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	4.01	ft³/s
Slope	0.01400	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.62	%
Intercepted Flow	3.99	ft³/s
Bypass Flow	0.02	ft³/s
Spread	10.84	ft
Depth	0.22	ft
Flow Area	1.17	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.42	ft/s
Equivalent Cross Slope	0.03677	ft/ft
Length Factor	0.95	
Total Interception Length	28.08	ft

Worksheet for Slotted Drain Inlet On Grade CB218 Sta 6836+90 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.71	ft³/s
Slope	0.01420	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.71	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.50	ft
Depth	0.21	ft
Flow Area	1.10	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.36	ft/s
Equivalent Cross Slope	0.03769	ft/ft
Length Factor	1.00	
Total Interception Length	26.89	ft

Worksheet for Slotted Drain Inlet On Grade CB220 Sta 6845+75 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.38	ft³/s
Slope	0.01220	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.55	%
Intercepted Flow	3.36	ft³/s
Bypass Flow	0.02	ft³/s
Spread	10.43	ft
Depth	0.21	ft
Flow Area	1.09	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.10	ft/s
Equivalent Cross Slope	0.03778	ft/ft
Length Factor	0.95	
Total Interception Length	24.67	ft

Worksheet for Slotted Drain Inlet On Grade CB222 Sta 6845+85 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.37	ft³/s
Slope	0.01250	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.34	%
Intercepted Flow	3.35	ft³/s
Bypass Flow	0.02	ft³/s
Spread	10.37	ft
Depth	0.21	ft
Flow Area	1.08	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.13	ft/s
Equivalent Cross Slope	0.03736	ft/ft
Length Factor	0.94	
Total Interception Length	24.99	ft

Worksheet for Slotted Drain Inlet On Grade CB224 Sta 6849+28 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.56	ft^3/s
Slope	0.01787	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.93	%
Intercepted Flow	2.56	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	8.75	ft
Depth	0.17	ft
Flow Area	0.77	ft^2
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.35	ft/s
Equivalent Cross Slope	0.03975	ft/ft
Length Factor	0.98	
Total Interception Length	23.88	ft

Worksheet for Slotted Drain Inlet On Grade CB226 Sta 6849+67.64 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.94	ft³/s
Slope	0.01499	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.78	%
Intercepted Flow	2.93	ft³/s
Bypass Flow	0.01	ft³/s
Spread	9.52	ft
Depth	0.19	ft
Flow Area	0.91	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.23	ft/s
Equivalent Cross Slope	0.03907	ft/ft
Length Factor	0.97	
Total Interception Length	24.26	ft

Worksheet for Slotted Drain Inlet On Grade CB227 Sta 6851+76.90 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	1.84	ft³/s
Slope	0.01310	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.84	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.19	ft
Depth	0.16	ft
Flow Area	0.67	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.74	ft/s
Equivalent Cross Slope	0.04071	ft/ft
Length Factor	1.08	
Total Interception Length	18.67	ft

Worksheet for Slotted Drain Inlet On Grade CB228 Sta 6852+80 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.60	ft³/s
Slope	0.01140	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	26.80	ft ← 40' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.60	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.82	ft
Depth	0.22	ft
Flow Area	1.17	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.07	ft/s
Equivalent Cross Slope	0.03727	ft/ft
Length Factor	1.07	
Total Interception Length	25.02	ft

Worksheet for Slotted Drain Inlet On Grade CB230 Sta 6854+00 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.76	ft³/s
Slope	0.00840	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.95	%
Intercepted Flow	2.76	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.37	ft
Depth	0.21	ft
Flow Area	1.07	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.57	ft/s
Equivalent Cross Slope	0.03736	ft/ft
Length Factor	0.99	
Total Interception Length	20.39	ft

Worksheet for Slotted Drain Inlet On Grade CB232 Sta 6856+60.91 I-10 EB

Project Description

Solve For	Efficiency

Input Data

Discharge	3.29	ft³/s
Slope	0.00390	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.29	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.79	ft
Depth	0.26	ft
Flow Area	1.63	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.01	ft/s
Equivalent Cross Slope	0.03467	ft/ft
Length Factor	1.10	
Total Interception Length	18.24	ft

Worksheet for Slotted Drain Inlet On Grade CB234 Sta 6856+70.97 I-10 WB

Project Description

Solve For	Efficiency

Input Data

Discharge	2.60	ft³/s
Slope	0.00290	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.60	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.37	ft
Depth	0.25	ft
Flow Area	1.53	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	1.70	ft/s
Equivalent Cross Slope	0.03507	ft/ft
Length Factor	1.12	
Total Interception Length	15.01	ft

Estrella Parkway

Worksheet for Slotted Drain Inlet On Grade CB304 Sta 13+20 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	1.12	ft^3/s
Slope	0.01840	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.12	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	6.37	ft
Depth	0.13	ft
Flow Area	0.41	ft^2
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.75	ft/s
Equivalent Cross Slope	0.04521	ft/ft
Length Factor	1.06	
Total Interception Length	15.76	ft

Worksheet for Slotted Drain Inlet On Grade CB308 Sta 16+81.20 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	1.01	ft³/s
Slope	0.02567	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.82	%
Intercepted Flow	1.01	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.23	ft
Depth	0.11	ft
Flow Area	0.36	ft²
Gutter Depression	0.02	ft
Total Depression	0.10	ft
Velocity	2.81	ft/s
Equivalent Cross Slope	0.04266	ft/ft
Length Factor	0.97	
Total Interception Length	17.26	ft

Worksheet for Slotted Drain Inlet On Grade CB312 Sta 15+63 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	0.97	ft³/s
Slope	0.01881	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.97	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.01	ft
Depth	0.12	ft
Flow Area	0.36	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.67	ft/s
Equivalent Cross Slope	0.04612	ft/ft
Length Factor	1.14	
Total Interception Length	14.75	ft

Worksheet for Slotted Drain Inlet On Grade CB316 Sta 19+41.49 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	1.19	ft³/s
Slope	0.05042	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	97.22	%
Intercepted Flow	1.16	ft³/s
Bypass Flow	0.03	ft³/s
Spread	6.24	ft
Depth	0.10	ft
Flow Area	0.31	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	3.85	ft/s
Equivalent Cross Slope	0.04073	ft/ft
Length Factor	0.86	
Total Interception Length	23.28	ft

Worksheet for Slotted Drain Inlet On Grade CB320 Sta 2+39.92 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	2.22	ft³/s
Slope	0.02607	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	23.45	ft ← 35' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.76	%
Intercepted Flow	2.21	ft³/s
Bypass Flow	0.01	ft³/s
Spread	7.72	ft
Depth	0.16	ft
Flow Area	0.60	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.71	ft/s
Equivalent Cross Slope	0.04222	ft/ft
Length Factor	0.97	
Total Interception Length	24.29	ft

Worksheet for Slotted Drain Inlet On Grade CB325 Sta 7+00 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.00930	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.94	ft
Depth	0.14	ft
Flow Area	0.48	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.07	ft/s
Equivalent Cross Slope	0.04387	ft/ft
Length Factor	1.07	
Total Interception Length	12.47	ft

Worksheet for Slotted Drain Inlet On Grade CB328 Sta 13+32 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	0.78	ft³/s
Slope	0.01430	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.78	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.84	ft
Depth	0.12	ft
Flow Area	0.34	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.29	ft/s
Equivalent Cross Slope	0.04582	ft/ft
Length Factor	1.08	
Total Interception Length	12.45	ft

Worksheet for Slotted Drain Inlet On Grade CB332 Sta 2+59 Ramp D

Project Description

Solve For	Efficiency

Input Data

Discharge	0.95	ft³/s
Slope	0.03519	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.85	%
Intercepted Flow	0.95	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.29	ft
Depth	0.11	ft
Flow Area	0.28	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.36	ft/s
Equivalent Cross Slope	0.04804	ft/ft
Length Factor	0.97	
Total Interception Length	17.22	ft

Worksheet for Slotted Drain Inlet On Grade CB338 Sta 6+50 Ramp D

Project Description

Solve For	Efficiency

Input Data

Discharge	0.66	ft³/s
Slope	0.01480	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	10.05	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	97.72	%
Intercepted Flow	0.64	ft³/s
Bypass Flow	0.02	ft³/s
Spread	5.43	ft
Depth	0.11	ft
Flow Area	0.30	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.22	ft/s
Equivalent Cross Slope	0.04765	ft/ft
Length Factor	0.88	
Total Interception Length	11.45	ft

Estrella Parkway Infield Areas

Worksheet for Ditch Inlet In Sag Ramp A CB302 Sta 13+20

Project Description

Solve For	Spread

Input Data

Discharge		5.09	ft³/s
Left Side Slope		0.10	ft/ft (H:V)
Right Side Slope		0.25	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	6.98	ft
Depth	0.36	ft
Wetted Perimeter	7.04	ft
Top Width	6.98	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp A CB306 Sta 16+69.39

Project Description

Solve For	Spread

Input Data

Discharge		6.47	ft³/s
Left Side Slope		0.10	ft/ft (H:V)
Right Side Slope		0.25	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	7.84	ft
Depth	0.42	ft
Wetted Perimeter	7.91	ft
Top Width	7.84	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp B CB310 Sta 15+63

Project Description

Solve For	Spread

Input Data

Discharge		6.84	ft^3/s
Left Side Slope		0.25	ft/ft (H:V)
Right Side Slope		0.10	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	8.06	ft
Depth	0.43	ft
Wetted Perimeter	8.14	ft
Top Width	8.06	ft
Open Grate Area	2.70	ft^2
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp B CB314 Sta 19+41.49

Project Description

Solve For	Spread

Input Data

Discharge		6.99	ft^3/s
Left Side Slope		0.25	ft/ft (H:V)
Right Side Slope		0.10	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	8.15	ft
Depth	0.44	ft
Wetted Perimeter	8.23	ft
Top Width	8.15	ft
Open Grate Area	2.70	ft^2
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp C CB318 Sta 2+39.92

Project Description

Solve For	Spread

Input Data

Discharge		4.99	ft³/s
Left Side Slope		0.10	ft/ft (H:V)
Right Side Slope		0.25	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	6.91	ft
Depth	0.35	ft
Wetted Perimeter	6.97	ft
Top Width	6.91	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp C CB324 Sta 7+00

Project Description

Solve For	Spread

Input Data

Discharge		6.17	ft³/s
Left Side Slope		0.10	ft/ft (H:V)
Right Side Slope		0.25	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	7.66	ft
Depth	0.40	ft
Wetted Perimeter	7.73	ft
Top Width	7.66	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp D CB330 Sta 2+59

Project Description

Solve For	Spread

Input Data

Discharge		6.83	ft^3/s
Left Side Slope		0.25	ft/ft (H:V)
Right Side Slope		0.10	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	8.06	ft
Depth	0.43	ft
Wetted Perimeter	8.13	ft
Top Width	8.06	ft
Open Grate Area	2.70	ft^2
Active Grate Weir Length	8.00	ft

Worksheet for Ditch Inlet In Sag Ramp D CB336 Sta 6+50

Project Description

Solve For	Spread

Input Data

Discharge		4.84	ft^3/s
Left Side Slope		0.25	ft/ft (H:V)
Right Side Slope		0.10	ft/ft (H:V)
Bottom Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Results

Spread	6.81	ft
Depth	0.34	ft
Wetted Perimeter	6.87	ft
Top Width	6.81	ft
Open Grate Area	2.70	ft^2
Active Grate Weir Length	8.00	ft

Bullard Avenue

Worksheet for Slotted Drain Inlet On Grade CB400 6+68.25 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	0.75	ft³/s
Slope	0.01370	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	6.70	ft ← 10' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	97.91	%
Intercepted Flow	0.73	ft³/s
Bypass Flow	0.02	ft³/s
Spread	3.29	ft
Depth	0.18	ft
Flow Area	0.25	ft²
Gutter Depression	0.12	ft
Total Depression	0.20	ft
Velocity	2.95	ft/s
Equivalent Cross Slope	0.09965	ft/ft
Length Factor	0.88	
Total Interception Length	7.58	ft

Worksheet for Slotted Drain Inlet On Grade CB402 17+70 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	2.11	ft³/s
Slope	0.02697	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.11	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.70	ft
Depth	0.23	ft
Flow Area	0.47	ft²
Gutter Depression	0.12	ft
Total Depression	0.20	ft
Velocity	4.49	ft/s
Equivalent Cross Slope	0.09194	ft/ft
Length Factor	1.11	
Total Interception Length	15.06	ft

Worksheet for Slotted Drain Inlet On Grade CB404 12+35 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	0.98	ft³/s
Slope	0.01923	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.37	%
Intercepted Flow	0.96	ft³/s
Bypass Flow	0.02	ft³/s
Spread	6.00	ft
Depth	0.12	ft
Flow Area	0.36	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.70	ft/s
Equivalent Cross Slope	0.04613	ft/ft
Length Factor	0.90	
Total Interception Length	14.91	ft

Worksheet for Slotted Drain Inlet On Grade CB406 13+25.22 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	0.61	ft^3/s
Slope	0.01923	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	10.05	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	96.10	%
Intercepted Flow	0.59	ft^3/s
Bypass Flow	0.02	ft^3/s
Spread	5.53	ft
Depth	0.10	ft
Flow Area	0.26	ft^2
Gutter Depression	0.01	ft
Total Depression	0.09	ft
Velocity	2.33	ft/s
Equivalent Cross Slope	0.04733	ft/ft
Length Factor	0.84	
Total Interception Length	12.03	ft

Worksheet for Slotted Drain Inlet On Grade CB408 7+20 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	0.85	ft³/s
Slope	0.01870	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.50	%
Intercepted Flow	0.85	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.35	ft
Depth	0.11	ft
Flow Area	0.34	ft²
Gutter Depression	0.01	ft
Total Depression	0.09	ft
Velocity	2.49	ft/s
Equivalent Cross Slope	0.04498	ft/ft
Length Factor	0.95	
Total Interception Length	14.14	ft

Worksheet for Slotted Drain Inlet On Grade CB410 13+25 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	0.52	ft³/s
Slope	0.01130	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.014	
Slot Length	10.05	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.52	ft³/s
Bypass Flow	0.00	ft³/s
Spread	3.45	ft
Depth	0.13	ft
Flow Area	0.23	ft²
Gutter Depression	-0.05	ft
Total Depression	0.08	ft
Velocity	2.23	ft/s
Equivalent Cross Slope	0.07125	ft/ft
Length Factor	1.34	
Total Interception Length	7.51	ft

Worksheet for Slotted Drain Inlet On Grade CB412 8+17 Ramp D

Project Description

Solve For	Efficiency

Input Data

Discharge	1.04	ft³/s
Slope	0.01465	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.64	%
Intercepted Flow	1.03	ft³/s
Bypass Flow	0.01	ft³/s
Spread	7.22	ft
Depth	0.13	ft
Flow Area	0.44	ft²
Gutter Depression	0.01	ft
Total Depression	0.09	ft
Velocity	2.38	ft/s
Equivalent Cross Slope	0.04274	ft/ft
Length Factor	0.91	
Total Interception Length	14.75	ft

Litchfield Road

Worksheet for Slotted Drain Inlet On Grade CB500 Sta 10+00 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	0.71	ft³/s
Slope	0.02290	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.99	%
Intercepted Flow	0.71	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.16	ft
Depth	0.10	ft
Flow Area	0.27	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.66	ft/s
Equivalent Cross Slope	0.04763	ft/ft
Length Factor	1.00	
Total Interception Length	13.47	ft

Worksheet for Slotted Drain Inlet On Grade CB502 Sta 14+88 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	1.28	ft³/s
Slope	0.04640	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.11	%
Intercepted Flow	1.27	ft³/s
Bypass Flow	0.01	ft³/s
Spread	5.64	ft
Depth	0.11	ft
Flow Area	0.32	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	4.02	ft/s
Equivalent Cross Slope	0.04634	ft/ft
Length Factor	0.93	
Total Interception Length	21.67	ft

Worksheet for Slotted Drain Inlet On Grade CB504 Sta 14+00 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	1.55	ft³/s
Slope	0.03480	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.91	%
Intercepted Flow	1.53	ft³/s
Bypass Flow	0.02	ft³/s
Spread	6.38	ft
Depth	0.13	ft
Flow Area	0.41	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.78	ft/s
Equivalent Cross Slope	0.04518	ft/ft
Length Factor	0.92	
Total Interception Length	21.87	ft

Worksheet for Slotted Drain Inlet On Grade CB506 Sta 18+78 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	1.46	ft³/s
Slope	0.03380	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.61	%
Intercepted Flow	1.45	ft³/s
Bypass Flow	0.01	ft³/s
Spread	6.27	ft
Depth	0.13	ft
Flow Area	0.40	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.69	ft/s
Equivalent Cross Slope	0.04544	ft/ft
Length Factor	0.95	
Total Interception Length	21.07	ft

Worksheet for Slotted Drain Inlet On Grade CB508 Sta 2+62 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	1.31	ft³/s
Slope	0.00380	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	10.05	ft ← 15' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	98.03	%
Intercepted Flow	1.28	ft³/s
Bypass Flow	0.03	ft³/s
Spread	9.09	ft
Depth	0.18	ft
Flow Area	0.83	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	1.58	ft/s
Equivalent Cross Slope	0.03974	ft/ft
Length Factor	0.89	
Total Interception Length	11.33	ft

Worksheet for Slotted Drain Inlet On Grade CB512 Sta 5+60 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.01600	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	99.24	%
Intercepted Flow	0.99	ft³/s
Bypass Flow	0.01	ft³/s
Spread	6.26	ft
Depth	0.13	ft
Flow Area	0.39	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.53	ft/s
Equivalent Cross Slope	0.04547	ft/ft
Length Factor	0.93	
Total Interception Length	14.36	ft

Worksheet for Slotted Drain Inlet On Grade CB514 Sta 2+36.15 Ramp D

Project Description

Solve For	Efficiency

Input Data

Discharge	1.71	ft³/s
Slope	0.01000	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	16.75	ft ← 25' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.71	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.38	ft
Depth	0.17	ft
Flow Area	0.70	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.43	ft/s
Equivalent Cross Slope	0.04096	ft/ft
Length Factor	1.01	
Total Interception Length	16.63	ft

Dysart Road

Worksheet for Slotted Drain Inlet On Grade CB600 Sta 18+34 Ramp A

Project Description

Solve For	Efficiency

Input Data

Discharge	1.70	ft³/s
Slope	0.01500	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft — 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.70	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.51	ft
Depth	0.23	ft
Flow Area	0.52	ft²
Gutter Depression	0.12	ft
Total Depression	0.21	ft
Velocity	3.30	ft/s
Equivalent Cross Slope	0.08919	ft/ft
Length Factor	1.14	
Total Interception Length	11.75	ft

Worksheet for Slotted Drain Inlet On Grade CB602 Sta 18+43 Ramp B

Project Description

Solve For	Efficiency

Input Data

Discharge	2.04	ft³/s
Slope	0.00857	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 30' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.04	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.22	ft
Depth	0.19	ft
Flow Area	0.85	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.39	ft/s
Equivalent Cross Slope	0.03954	ft/ft
Length Factor	1.15	
Total Interception Length	17.47	ft

Worksheet for Slotted Drain Inlet On Grade CB604 Sta 6+87 Ramp C

Project Description

Solve For	Efficiency

Input Data

Discharge	0.90	ft³/s
Slope	0.01320	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	13.40	ft ← 20' SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.90	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.24	ft
Depth	0.13	ft
Flow Area	0.39	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	2.30	ft/s
Equivalent Cross Slope	0.04552	ft/ft
Length Factor	1.03	
Total Interception Length	12.96	ft

Worksheet for Slotted Drain Inlet On Grade CB606 Sta 3+02 Ramp D

Project Description

Solve For	Efficiency

Input Data

Discharge	1.44	ft³/s
Slope	0.02933	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.014	
Slot Length	20.10	ft ← 3d SLOTTED DRAIN
Local Depression	1.00	in
Local Depression Width	2.50	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.44	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.41	ft
Depth	0.13	ft
Flow Area	0.41	ft²
Gutter Depression	0.00	ft
Total Depression	0.09	ft
Velocity	3.48	ft/s
Equivalent Cross Slope	0.04511	ft/ft
Length Factor	1.00	
Total Interception Length	20.17	ft

APPENDIX E

STORMCAD ANALYSES

(RESERVED FOR FINAL DRAINAGE REPORT)

APPENDIX F

DITCH DESIGN

(RESERVED FOR FINAL DRAINAGE REPORT)

APPENDIX G

RETENTION BASIN DESIGN

(RESERVED FOR FINAL DRAINAGE REPORT)

APPENDIX H

AGUA FRIA HYDROLOGIC/HYDRAULIC DATA

Agua Fria River
Pier Scour Calculations

PIER SCOUR: FHWA (HEC 18) CSU Equation

Project:	Agua Fria River	**Computed by:**	Dave Schaub
Location:	I-10	**Date:**	25-Feb-08
Description:	**Pier Scour Depth @ Agua Fria River Bridge**	**Checked by:**	
	16' clear on existing and new outside columns	**Date:**	

References:
1) FHWA, *Evaluating Scour At Bridges* (HEC-18), May 2001 &
2) ADOT, *Highway Drainage Design Manual-Hydraulics*, January 2006

Pier Input:

Pier Diameter:	3.00	ft
Debris:	2.00	ft on each side
Effective Pier Diameter (a):	7.00	ft

Hydraulic Input:

Storm Event (Years):	10-yr	100-yr	500-yr
Depth of Flow, Y_1 (ft):	N/A	5.64	8.09
Average Velocity, V_1 (fps):	N/A	7.47	9.85
Froude Number, Fr_1:	N/A	0.57	0.63

Correction Factors:

Pier Type, K_1:	1.1	Cylindrical Columns
Angle of Attack, K_2:	1.0	
Bed Condition, K_3:	1.1	
Armouring, K_4:	1.0	

Particle Size:

D_{50}:	0.7	mm	0.028	inches
D_{95}:	??	mm	#VALUE!	inches

Scour Equation: $Y_s/Y_1 = 2*K_1*K_2*K_3*K_4*(a/Y_1)^{0.65}Fr_1^{0.43}$

10-yr Scour Depth (ft)	**Y_s (10-yr) =**	#VALUE!		
100-yr Scour Depth (ft)	**Y_s (100-yr) =**		12.33	
500-yr Scour Depth (ft)	**Y_s (500-yr) =**			14.61
Contraction & General Scour (ft)			0.20	0.20
Long Term Degradation (ft)	Maintained Channel		1	1
Total 10-yr Scour Depth:		#VALUE!		
Total 100-yr Scour Depth:			13.53	
Total 500-yr Scour Depth:				15.81
TOTAL PIER SCOUR:		**15.81**	**ft**	

Conclusion: **Assume a scour hole of 15.81-ft below the channel invert. Effective support needs to extend beneath the potential scour hole. With a future channel Invert Elevation of 971.9, the bottom of the scour hole is 956.1.**
Maximum scour depth occurs at flow of 99,000 cfs, which is the Q500.

PIER SCOUR: FHWA (HEC 18) CSU Equation

Project:	Agua Fria River	**Computed by:**	Dave Schaub
Location:	I-10	**Date:**	25-Feb-08
Description:	**Pier Scour Depth @ Agua Fria River Bridge**	**Checked by:**	
	14' clear between 2 outside columns and	**Date:**	
	16' clear on all inside columns		

References:
1) FHWA, *Evaluating Scour At Bridges* (HEC-18), May 2001 &
2) ADOT, *Highway Drainage Design Manual-Hydraulics*, January 2006

Pier Input:

Pier Diameter:	7.56	ft
Debris:	2.00	ft on each side
Effective Pier Diameter (a):	11.56	ft

Hydraulic Input:

Storm Event (Years):	10-yr	100-yr	500-yr
Depth of Flow, Y_1 (ft):	N/A	5.64	8.09
Average Velocity, V_1 (fps):	N/A	7.47	9.85
Froude Number, Fr_1:	N/A	0.57	0.63

Correction Factors:

Pier Type, K_1:	1.1	Cylindrical Columns
Angle of Attack, K_2:	1.0	
Bed Condition, K_3:	1.1	
Armouring, K_4:	1.0	

Particle Size:

D_{50}:	0.7	mm	0.028	inches
D_{95}:	??	mm	#VALUE!	inches

Scour Equation: $Y_s/Y_1 = 2*K_1*K_2*K_3*K_4*(a/Y_1)^{0.65}Fr_1^{0.43}$

10-yr Scour Depth (ft)	**Y_s (10-yr) =**	#VALUE!	
100-yr Scour Depth (ft)	**Y_s (100-yr) =**	17.09	
500-yr Scour Depth (ft)	**Y_s (500-yr) =**		20.24
Contraction & General Scour (ft)		0.20	0.20
Long Term Degradation (ft)	Maintained Channel	1	1
Total 10-yr Scour Depth:	#VALUE!		
Total 100-yr Scour Depth:		18.29	
Total 500-yr Scour Depth:			21.44
TOTAL PIER SCOUR:	**21.44**	**ft**	

Conclusion: **Assume a scour hole of 21.44-ft below the channel invert. Effective support needs to extend beneath the potential scour hole. With a future channel Invert Elevation of 971.9, the bottom of the scour hole is 950.5. The top and bottom elevations of the existing spread footings are 949.2 and 946.2.**
Maximum scour depth occurs at flow of 99,000 cfs, which is the Q500.

URS

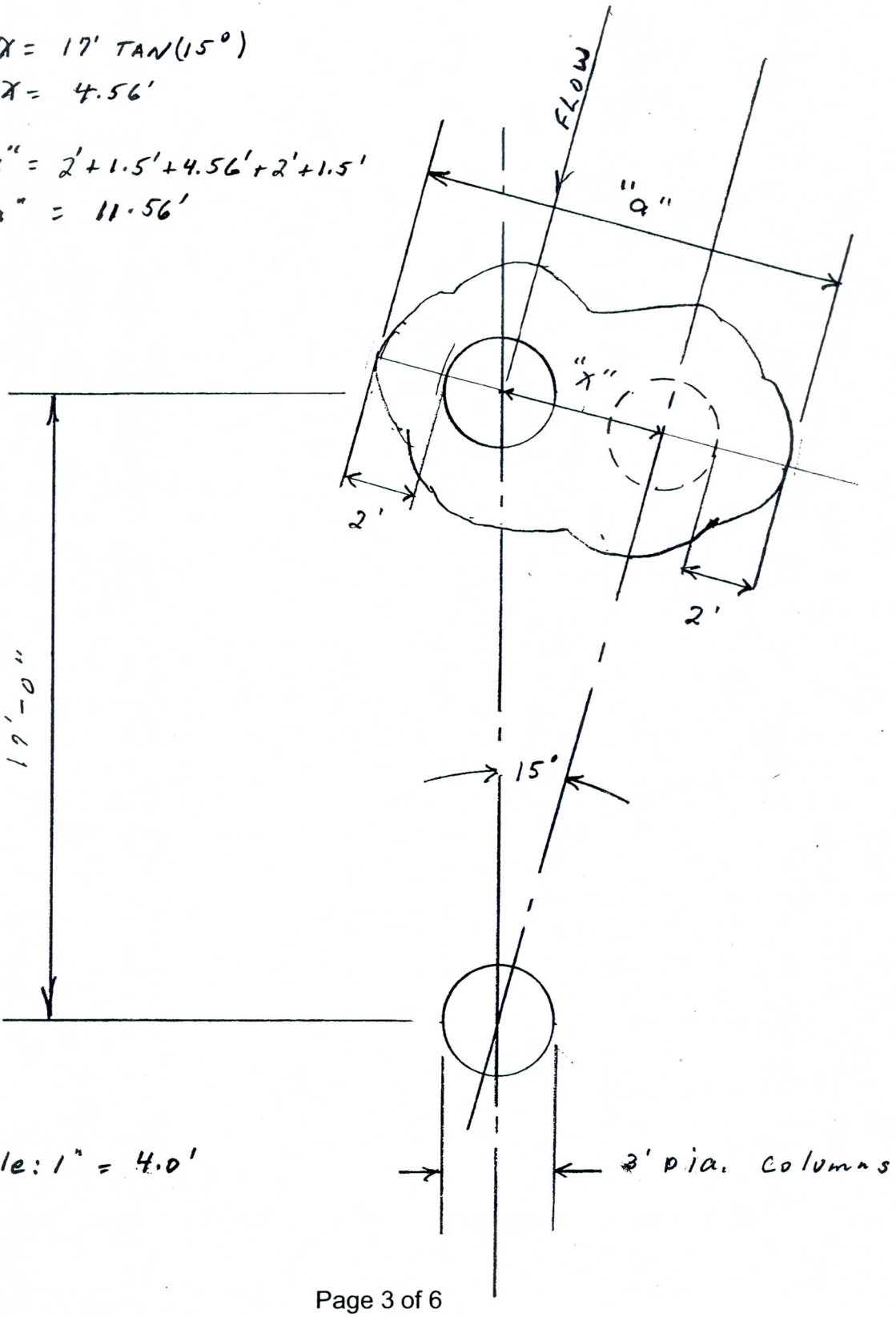
Job Agua Fria Bridge | Project No. | Page ____ of ____
Description Pier width "a" for Outside Pier clear Spacing Less than 16 feet | Computed by D. Schaub | Date 2/25/08
Checked by | Date
Reference | Sheet 1 of 1

$X = 17' \tan(15°)$

$X = 4.56'$

"a" $= 2' + 1.5' + 4.56' + 2' + 1.5'$

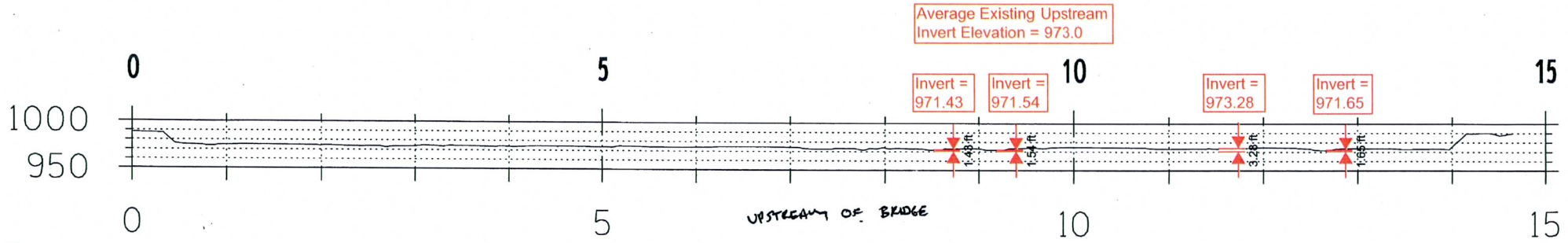
"a" $= 11.56'$



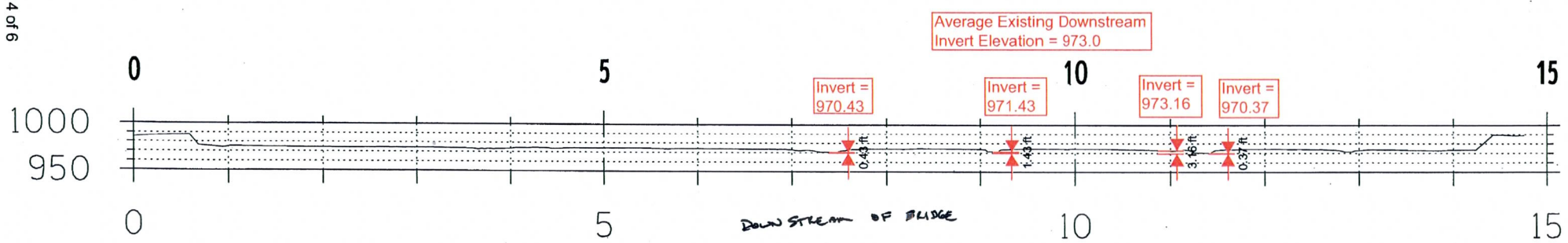
AGUA FRIA RIVER

LOOKING DOWNSTREAM

NAVD88 Datum

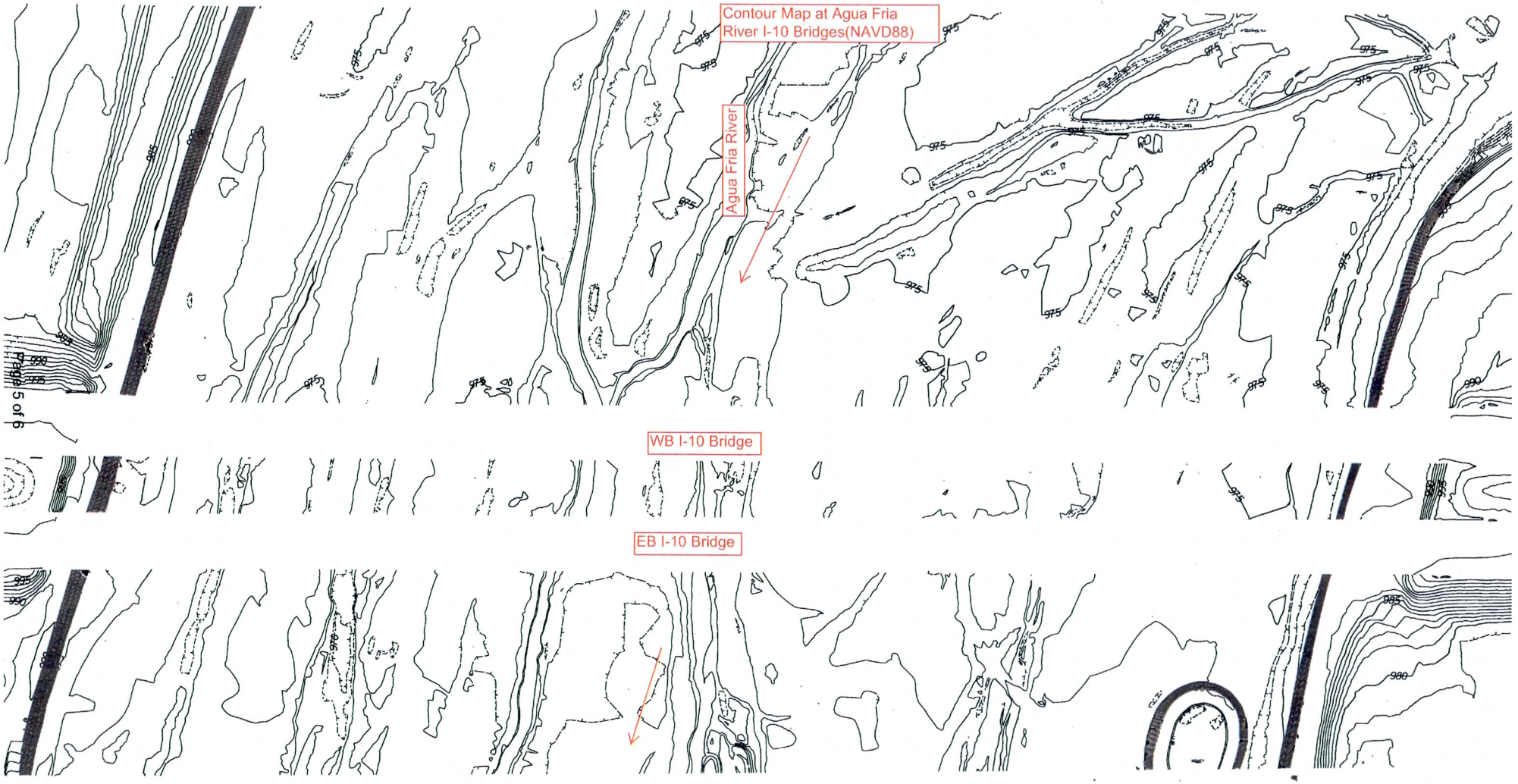


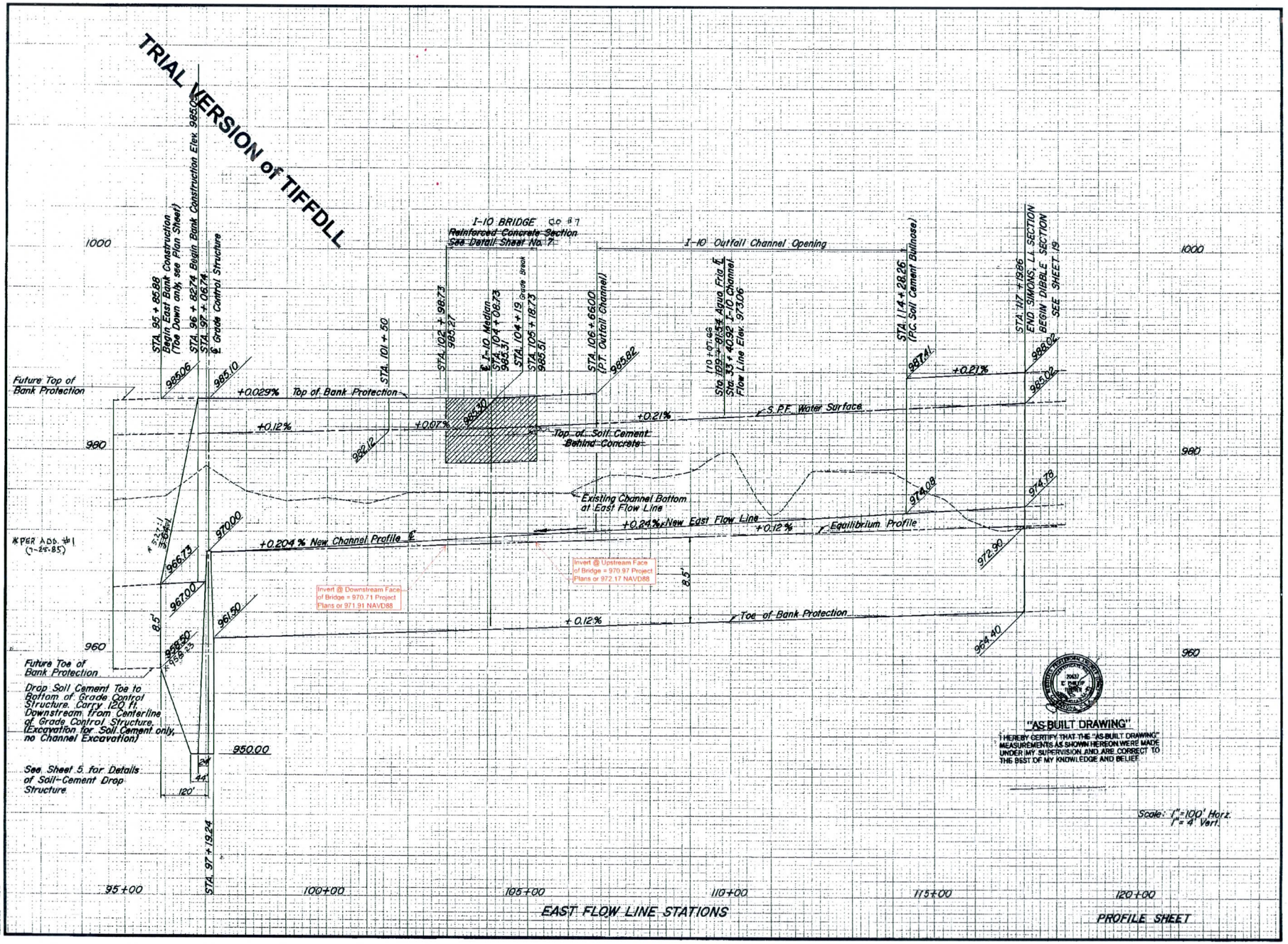
UPSTREAM OF BRIDGE



DOWNSTREAM OF BRIDGE

Conclusion: The existing contour maps (NAVD88) show that stream invert elevations at the bridge range from 970.43 to 973.28 with an average elevation of 973.0. The low elevations do not represent the thalweg, but are actual low spots within the channel. The Agua Fria River Channel Improvement Plans showed stabilized invert elevations at the I-10 bridge of 971.91 (NAVD88) and 972.17 (NAVD88), downstream and upstream respectively. To determine the elevation at the bottom of the scour hole, assume that the streambed elevation is 971.9 (NAVD88).


Contour Map at Agua Fria River I-10 Bridges(NAVD88)
Agua Fria River
WB I-10 Bridge
EB I-10 Bridge
N
975
980
985
990



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FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street - Phoenix Arizona 85009 - Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS
I-10 to McDowell Road

Project No.	AZ-MC-07
Date:	April '85
Design:	E.E.C., R.N.B.
Drawn:	M.A.F.
Check:	J.K.L., J.B.L.
Revisions:	

17 of 43

Agua Fria River
Hydraulic Summary
For
Median and Outside Widening (both current & future)

TABLE

Agua Fria River Floodplain Water Surface Elevations, $Q_{(spf)}$ = 99,000 cfs

I-10 Existing Bridges Versus Proposed Bridge

(EB & WB Bridges widened to inside Median and to outsides)

River Station	Description	Water Surface Elevation (W.S.E.)		Δ W.S.E.[1]	Top of Left Levee (East Levee)	Top of Right Levee (West Levee)	Meets 4-foot Freeboard Requirements[4]
		Existing	Proposed				
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
5.6500	210' DS of McDowell Rd Bridge Face	982.12	982.15	0.03	987.40	995.5	Yes
5.5400		982.01	982.04	0.03	980[3]	988.6	Yes
5.5100		981.83	981.87	0.04	980[3]	990.1	Yes
5.4800		981.72	981.75	0.03	980[3]	989.0	Yes
5.3800	280" US of Bridge Face	981.39	981.42	0.03	993.00	988.6	Yes
5.3280	US Bridge Face	980.33	980.42	0.09	994.50	997.7	Yes
5.3225[2]	Westbound I-10 Bridge[2]						
5.2975[2]	Eastbound I-10 Bridge[2]						
5.2900	DS Bridge Face	979.44	979.34	-0.10	994.50	997.7	Yes
5.2700	125' DS of Bridge Face	977.87	977.87	0.00	987.20	996.3	Yes

(1) The change in water surface elevation goes to an increase of 0.01 feet 610 feet upstream of the McDowell Road Bridge and to zero (0) 1760 feet upstream of the McDowell Road Bridge.

(2) Proposed Bridge with EB & WB Bridges widened to fill in 65' Wide Median is at River Station 5.2975. The single widened bridge is also widened to each outside to add 2 lanes in each direction. The bridge is widened from 183'-2" to 229'-2". The current project would add two more lanes, one in each direction. A future project would add two more lanes, one in each direction. The substructure units would be constructed for the future widening.

(3) I-10 Collector Channel Inlet to the Agua Fria River through the East Levee.

(4) U.S. Army Corps' of Engineers Freeboard Requirements

(5) Low Concrete of I-10 Bridge in the model is 986.4, which provides 6.0' and 7.1' of freeboards at the upstream and downstream faces of the bridge, respectively. This is for the Standard Project Flood.

DATE: 23 June 2007

Subject: Changes to HEC-RAS Model for median widening of I-10 Bridges over the Agua Fria River

By: Dave Schaub

URS changes to the HEC-RAS Agua Fria River files to model I-10 Bridge as a single bridge:

1. Removed upstream section for Eastbound Bridge.
2. Removed downstream section for Westbound Bridge.
3. Modeled I-10 Bridge as one bridge with Eastbound and Westbound bridges widened to fill in the 65-foot median.
4. Additional three 3-foot diameter columns at each pier within the median between the two bridges. These columns will be in alignment with the existing upstream and downstream piers.
5. Corrected the location of a change in peak flow for the SPF. The original modeled changed the SPF value from 54,400 cfs to 99,000 cfs between the two I-10 bridges. Since there is no inflow point between these bridges, this is an impossible situation. Moved the change in peak flow to just upstream of the Westbound Bridge, which also is the inflow point for the I-10 Collector Channel inflow point.

Date: 26 February 2008

Subject: Changes to HEC-RAS Model for current and future outside widening of I-10 Bridge over the Agua Fria River.

By: Dave Schaub

Additional URS changes to the HEC-RAS Agua Fria River files to model the I-10 Bridge as a single future widened bridge:

1. Additional one 3-foot diameter column upstream and downstream at each pier. Assumed column at outside edge of widened bridge.
2. Bridge widened from 183'-2" to 229'-2". This includes 4 additional lanes, 2 in each direction. The current project would add two lanes, one in each direction. A future project would add two more lanes, one in each direction. The substructure units would be constructed for the future widening.
3. Lowered the low concrete of the bridge by 0.5 feet to model the pavment drop of 0.48 feet (24'x0.02'/ft) for the 24' widening to each side. The pavement cross-slope is 0.02'/ft.
4. Since there is no roadway overflow, I did not change the top of roadway elevations.

Agua Fria River
Hydraulic Summary
For
Median Widening

From:	Dave Schaub
To:	jmr@mail.maricopa.gov; jwh@mail.maricopa.gov; lmt@mail.maricopa.gov
cc:	jbeimer@azdot.gov; Bill Dehn; Randy Simpson
Subject:	I-10 Median Widening Permit 2007p031 - Bullard Wash & Agua Fria River
Date:	06/23/2007 02:31 PM
Attachments:	CommentResponse_Memo_to_FCDMC_23June2007.pdf

Joe Rumann requested that the HEC-RAS model be revised to reflect the widening of the Eastbound and Westbound I-10 Bridges to fill in the 65-foot wide median. This analysis has been completed and documented in the attached memorandum. The revised model results in virtually the same water surface elevations as the original model for the design flood, which is the Standard Project Flood (SPF) of 99,000 cfs.

CommentResponse_Memo_to_FCDMC_23June2007.pdf

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URS

Comments/Responses Memorandum
Arizona Department of Transportation
I-10 (Papago) Median Widening
Sarival Avenue to SR101L
Project No. 010 MA 126 h7096 01 C
Federal Aid No. 010-B(201)N
(June 23, 2007)

FLOOD CONTROL DISTRICT
of Maricopa County
Review Comment by Joe Rumann
For
Draft Final Drainage Report, December 2006
And
Stage III Construction Plans, December 2006

Joe Rumann sent an internal FCDMC E-Mail on the 31st of January 2007. URS received a copy of this E-Mail the 21st of June 2007. The comment is as follows:

"The drainage report indicates that since the new piers align with the existing, the water surface elevations should not increase. This is not necessarily true. Please ask the designers to demonstrate that the 4-foot freeboard requirement in the Agua Fria is still provided. If you have any questions please let me know, thank you."

As requested, we have revised the HEC-RAS model (converted from the HEC-2 model) to model the I-10 bridges as one bridge. The original model contained separate bridges for the Eastbound and Westbound roadways. The proposed median widening project will result in widening the Eastbound and Westbound bridges to fill in the 65-foot wide median. The widening will consist of three additional 3-foot diameter columns at each pier within the median between the two bridges. These columns will be in alignment with the existing upstream and downstream piers. Model revisions consisted of removing the section at the upstream face of the Eastbound Bridge and the section at the downstream face of the Westbound Bridge, and then revising the bridge to reflect a single, wider bridge.

The revised model provides virtually the same water surface elevations as the original model for the design flood, which is the Standard Project Flood (SPF) of 99,000 cfs. In fact, the water surface elevations show a decrease of 0.01 to 0.02 feet for the widened bridge. This decrease goes to zero (0) approximately 310 feet upstream of the McDowell Road Bridge.

Freeboard just upstream of the I-10 Bridges varies from 6.59 to 7.21 feet for the West bank (Left Levee) and is 6.59 feet for the East bank (Right Levee). The East bank is breached with the I-10 Collector Channel, but the banks of the channel appear to maintain the required 4-foot freeboard. Since the proposed widening will lower the water surface elevation, the existing freeboard will not be compromised.

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URS

Flood Control District Review Comments
URS Responses
I-10 (Papago) Median Widening
Sarival to SR101L
(June 23, 2007)

Documentation of this analysis is contained in the attached table and Floodplain Water Surface Profiles for both existing and proposed conditions.

TABLE

Agua Fria River Floodplain Water Surface Elevations, $Q_{(spf)}$ = 99,000 cfs

Existing I-10 Bridges Versus Proposed I-10 Bridge (EB & WB Bridges Widened to fill in the 65' Median)

River Station	Description	Water Surface Elevation (W.S.E.)		Δ W.S.E.[1]	Top of Left Levee (East Levee)	Top of Right Levee (West Levee)	Meets 4-foot Freeboard Requirements[4]
		Existing	Proposed				
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
5.6500	210" DS of McDowell Rd Bridge Face	982.12	982.11	-0.01	987.4	995.5	Yes
5.5400		982.01	982.00	-0.01	980[3]	988.6	Yes
5.5100		981.83	981.82	-0.01	980[3]	990.1	Yes
5.4800		981.72	981.71	-0.01	980[3]	989.0	Yes
5.3800	280" US of Bridge Face	981.39	981.37	-0.02	993.0	988.6	Yes
5.3280	US Bridge Face	980.33	980.31	-0.02	994.5	997.7	Yes
5.3225[2]	Westbound I-10 Bridge[2]						
5.2975[2]	Eastbound I-10 Bridge[2]						
5.2900	DS Bridge Face	979.44	979.44	0	994.5	997.7	Yes
.2700	125' DS of Bridge Face	977.87	977.87	0	987.2	996.3	Yes

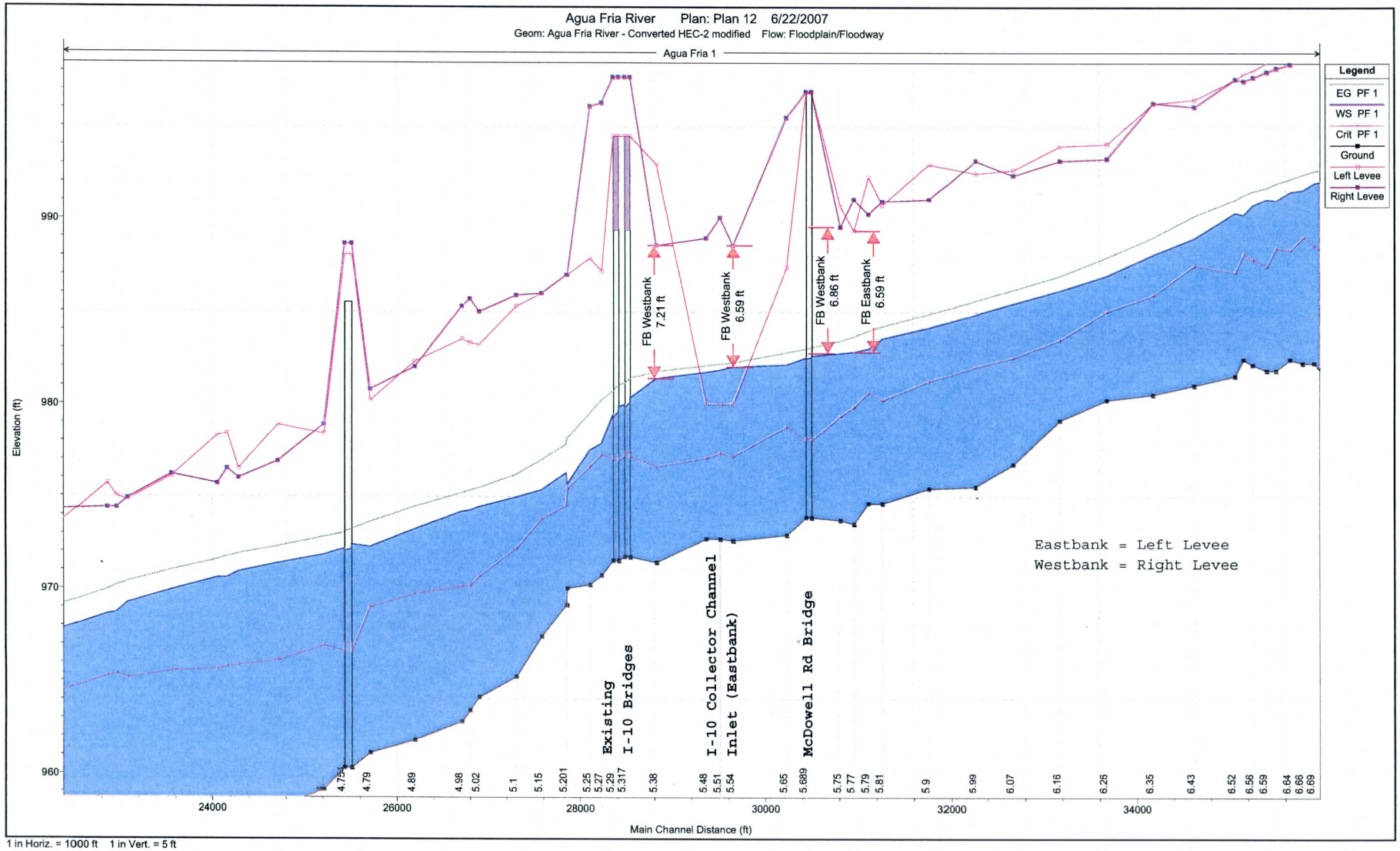
(1) The change in water surface elevation goes to zero (0) 310 feet upstream of the McDowell Road Bridge.

(2) Proposed Bridge with EB & WB Bridges Widened to fill in 65' Wide Median is at River Station 5.2975.

(3) I-10 Collector Channel Inlet to the Agua Fria River through the East Levee.

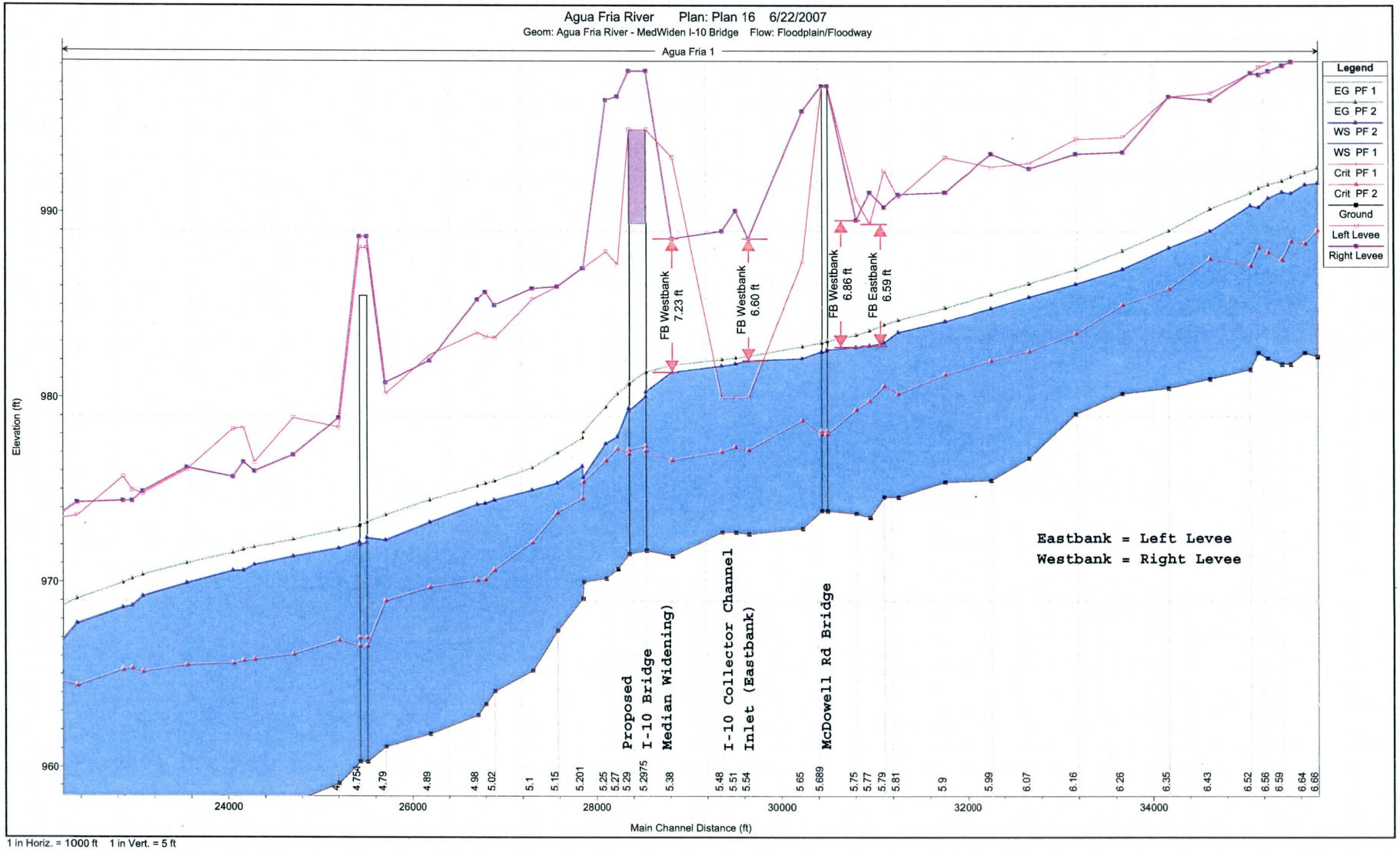
(4) U.S. Army Corps' of Engineers Freeboard Requirements

Floodplain Water Surface Profile, Q(spf) = 99,000 cfs
I-10 Bridges over Agua Fria River
Existing Conditions (EB & WB Bridges Separated by 65' Wide Median)



1 in Horiz. = 1000 ft 1 in Vert. = 5 ft

Floodplain Water Surface Profile, Q(spf) = 99,000 cfs
I-10 Bridge (with Median Widening) over Agua Fria River
Proposed Conditions (EB & WB Bridges Widened to fill in 65' Wide Median)



1 in Horiz. = 1000 ft 1 in Vert. = 5 ft

Agua Fria River
Bridge Deck Drains
Analysis

Pavement Spread Calculations
for
Eastbound I-10 Bridge over Agua Fria River

Problem Statement: Evaluate the hydraulic capacity of the proposed scuppers on the I-10/Agua Fria River Bridge with the bridge widened into the median and to the outside. The existing scuppers are 6-inch diameter holes with 0.5-inch depression placed at 19-foot intervals along the outside edge of the bridge. The bridge will be widened from 91'-7" to 102'-7" throughout its entire length. Check capacity of scuppers with a width of 102'-7" and a spacing of 18.75 feet. The typical span length is 75 feet.

1. **Calculate the proposed Q for one 6-inch scupper:**

   Q = CiA

   C = 0.95 for pavement

   i = 3.8 inches/hour for 10-year storm event

   Area Calculations

   width = 102.58 ft length = 18.75 ft

   A = 0.044155 acres

   Q = CiA = (0.95)(3.80)(.044155) = 0.159 cfs

2. **Calculate the maximum spread in accordance with ADOT criterion.**

   Max Spread = Gutter + Shoulder + 0.5 Travel Lane

   Max Spread = 12' + (0.5)(12') = 18 feet

3. **Calculate the maximum allowable depth based on spread of 18 feet.**

   Max Depth = (18')(0.02ft/ft) + 0.5"/12 = 0.402 feet

4. **Calculate the maximum Q based on allowable depth of 0.402 feet. Use HEC-22 Equation for Orifice Flow.**

   Q = (Orifice Coeficent)(A)(2x32.2xd)$^{0.5}$(Clogging Factor)

A (Orifice Area) =	(3.14(6"/12)^2)/4 =	0.196	sf
d (Depth of Flow) =		0.402	ft
Clogging Factor =		0.5	
Orifice Coef (OC)=		0.67	

   Q = 0.67(0.196 sf)(2 x 32.2 x 0.402)$^{0.5}$(0.5) = 0.334 cfs

5. **Conclusion**

   The proposed scuppers can be used to maintain the ADOT maximum allowable spread. The actual 10-year runoff to each scupper is 0.159 cfs whereas the maximum allowable runoff is 0.334 cfs.

Pavement Spread Calculations
for
Westbound I-10 Bridge over Agua Fria River

Problem Statement: Evaluate the hydraulic capacity of the proposed scuppers on the I-10/Agua Fria River Bridge with the bridge widened into the median and to the outside. The existing scuppers are 6-inch diameter holes with 0.5-inch depression placed at 19-foot intervals along the outside edge of the bridge. The bridge will be widened from 91'-7" to 102'-7" throughout most of its length. At the west end of the birdge the width tapers to a maximum width of approximately 106'±. Check capacity of scuppers with a width of 106 feet and a spacing of 18.75 feet. The typical span length is 75 feet.

1. **Calculate the proposed Q for one 6-inch scupper:**

   Q = CiA

   C = 0.95 for pavement

   i = 3.8 inches/hour for 10-year storm event

   Area Calculations

   width = 106 ft length = 18.75 ft

   A = 0.045627 acres

   Q = CiA = (0.95)(3.80)(.045627) = 0.165 cfs

2. **Calculate the maximum spread in accordance with ADOT criterion.**

   Max Spread = Gutter + Shoulder + 0.5 Travel Lane

   Max Spread = 12' + (0.5)(12') = 18 feet

3. **Calculate the maximum allowable depth based on spread of 18 feet.**

   Max Depth = (18')(0.02ft/ft) + 0.5"/12 = 0.402 feet

4. **Calculate the maximum Q based on allowable depth of 0.402 feet. Use HEC-22 Equation for Orifice Flow.**

   Q = (Orifice Coeficent)(A)$(2x32.2xd)^{0.5}$(Clogging Factor)

A (Orifice Area) =	$(3.14(6"/12)^2)/4$ =	0.196	sf
d (Depth of Flow) =		0.402	ft
Clogging Factor =		0.5	
Orifice Coef (OC)=		0.67	

   Q = $0.67(0.196\ sf)(2 \times 32.2 \times 0.402)^{0.5}(0.5)$ = 0.334 cfs

5. **Conclusion**

   The proposed scuppers can be used to maintain the ADOT maximum allowable spread. The actual 10-year runoff to each scupper is 0.165 cfs whereas the maximum allowable runoff is 0.334 cfs.

Agua Fria River
Hydrologic/Hydraulic Data
From
Final Drainage Report
I-10 Median Widening
Sarival Avenue to SR 101L

ECS Contract No. 06-44
TRACS No. H7096 01D

March 2007

Recd 11/21/83

FINAL REPORT

SYSTEM ANALYSIS AND CONCEPTUAL DESIGN OF CHANNELIZATION IN THE AGUA FRIA RIVER

Submitted to:

Flood Control District of Maricopa County
3335 West Durango
Phoenix, Arizona 85009

By:

Simons, Li & Associates, Inc.
P.O. Box 1816
Fort Collins, Colorado 80522

July 20, 1983

Revised

October 10, 1983

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V. QUANTITATIVE GEOMORPHIC ANALYSIS

5.1 Quantitative Geomorphic Analysis of Channelization

Total scour is broken down into three components which include (1) local scour due to acceleration of flow around obstructions in the flow, (2) contractual scour or general regional scour due to a constriction in the flow, and (3) the general aggradation/degradation response of the river bed. The total scour analysis was performed at all the existing bridge sites, flume crossings and proposed bridges in the study reach.

5.2 Local Scour Analysis

As explained in the previous report for existing conditions, local scour was computed at the bridge sites using Shen and Neil's methods and compared to determine which of the two methods yielded the most reasonable local scour depth for bridge piers. Shen and Neil's equations were empirically developed from extensive test data on sand-bed channels and will provide reasonable approximations of local scour depths on the Agua Fria River. Since the suggested channelization involves levees on both sides of the river, the bridge abutments will not be protruding into the flow, therefore any scour that occurs near the bridge abutments will be from the general degradation response of the bed. Consequently, abutment scour was considered in the analysis.

For all local scour computations two feet of width was added to either side of the piers to account for accumulation of debris. Also considered in the analysis was any flow skew potential that might result from channelization at bridge crossings. Where possible, flow skew was avoided in the design; however, because of the alignment of existing bridge piers, this was not always possible. Hydraulic conditions at each of the bridge and flume crossings were determined using HEC-II.

Table 5.1 summarizes for each of the seven crossings the present bed elevation, the depth bridge piers extend below the present bed elevation, the dimensions of bridge piers, spacing between piers, span length of the bridge, skew angle expected, scour depths for the 100-year discharge of 95,000 cfs computed using Shen and Neil's methodologies, and the adopted local scour expected at the bridge.

Table 5.1. Summary of Local Scour Depths Expected at Bridge Crossings with Proposed Channelization.

Bridge Crossing	Present Bed Elevation	Approximate Depth of Supports Below Present Bed (ft)	Dimensions of Bridge Piers	Spacing Between Piers (ft)	Bridge Span (ft)	Skew Angle Considered (degrees)	Local Scour Shen (ft)	Local Scour Neil (ft)	Adopted Local Scour Value (ft)
Camelback Road[1]	1,017.1	70	4' diameter	115	1,725	0	10.4	13.3	11.9
Camelback Road[2]	1,017.1	70	4' diameter	115	1,725	0	10.3	13.4	11.9
Indian School Road	1,000.0	Piers 1-12 25' Piers 13-17 70'	1'8" wide Piers 1-12	90	1,620	10	16.9	17.0	17.0
			4' diameter Piers 13-17						
Roosevelt Irrigation District flume	995.0	23-31	4' wide	72	1,008	0	14.1	13.6	13.9
McDowell Road	977.0	70	5' diameter	125	1,250	0	18.0	15.8	16.9
I-10	968.0	23	3.3' diameter	75	1,500	0	15.3	12.9	14.1
Southern Pacific Railroad	951.2	30	6'8" pier deck support section	153	1,200	0	16.6	16.6	16.6
			2' ballast support section	15					
Buckeye Road	951.0	28	3' wide	80	1,200	0	12.1	12.0	12.0

[1] This case considers a levee on the east bank and partial levee construction on the west bank downstream of Camelback Road.

[2] This case considers complete levee construction on the east and west banks downstream of Camelback Road.

With the suggested channelization several transmission towers will be inside the levees. Both the Salt River Project and the Tucson Electric Power Company have towers within the levees that will be subjected to local scour. Plates 1 through 4 attached with this report show locations of towers within the channelized reach.

The Salt River Project has 4 towers within the channelization reach near Thomas Road. Table 5.2 summarizes for each tower the obstruction width of each footing, the 100-year flow velocity and depth, the elevation of the bottom of the footing, the 100-year local scour depth as computed using Shen and Neil's equations, the adopted local scour, the approximate ground elevation after channelization in the vicinity of the tower and the expected elevation after scour. All the towers will require some type of protection as the scour depths combined with the proposed channelization will undermine all towers.

Tucson Electric Power Company has 13 towers within the channelized reach. Table 5.3 summarizes local scour depths for the 13 towers for the 100-year flood. All of these towers will require protection as all the local scour depths are quite large for the 100-year discharge.

5.3 General Regional Scour

General regional scour at contractions occurs because the effective flow area is reduced by dikes. These contractions increase the local average velocity and bed shear stress. Hence, there is an increase in stream power at the contraction and more bed material is transported through the contracted section than is transported into the section. As the bed level is lowered, velocity decreases, shear stress decreases and equilibrium is restored when the sediment transport rate from the contracted section is equal to the incoming rate.

The channelized portion of the Agua Fria having the most severe contractual scour is at Camelback Road. The effective flow width upstream of Camelback Road is approximately 2,425 feet. The flow width necks down to approximately 1,630 feet downstream of the proposed bridge. For the remaining channelization, general regional scour becomes negligible due to the gradual expansions and contractions of the proposed alignment.

Table 5.2. Local Scour Around Towers - Salt River Project for Channelized Conditions

Tower Number	Obstruction Width	Flow Velocity (ft/sec)	Flow Depth (ft)	Elevation at Bottom of Footing	Local Scour			Approximate Channelized Ground Elevation	Elevation After Scour
					Shen (ft)	Neil (ft)	Adopted Scour (ft)		
58	3'	10.62	9.15	987'	8.04	9.44	8.7	990.4	981.7
59	3'	9.44	9.45	987'	7.48	9.02	8.3	985.1	976.8
60	3'	9.13	9.34	979'	7.33	8.87	8.1	983.8	975.7
61	3'	9.32	9.25	981'	7.42	8.94	8.2	982.9	974.7

Table 5.3. Local Scour Around Towers - Tucson Gas & Electric Co. for Channelized Conditions

Tower Number	Obstruction Width	Flow Velocity (ft/sec)	Flow Depth (ft)	Local Scour			Approximate Channelized Ground Elevation	Elevation After Scour
				Shen (ft)	Neil (ft)	Adopted Scour (ft)		
87	5'	10.77	8.94	11.13	13.20	12.2	989.7	977.8
88 (R)	10'	9.30	9.38	15.61	19.57	13.9	984.3	970.4
89 (R)	10'	9.22	9.30	15.53	19.48	17.5	983.4	965.9
90	5'	9.46	9.08	10.27	12.51	11.4	982.2	970.8
94	5'	9.62	8.65	10.38	12.52	11.5	974.0	962.5
96 (R)	10'	10.42	7.38	16.75	19.90	18.3	972.1	953.8
97	5'	8.87	6.94	9.87	11.73	10.8	966.3	955.5
98	5'	8.65	7.16	9.72	11.66	10.7	963.7	953.0
99 (R)	10'	8.47	7.30	14.73	18.18	16.5	961.7	945.2
100 (R)	10'	8.50	7.59	14.77	18.30	16.5	959.0	942.5
101 (R)	10'	8.46	7.89	14.72	18.36	16.5	957.6	941.1
102 (R)	10'	8.41	8.64	14.67	18.54	16.6	954.8	938.2
103 (R)	10'	8.70	9.14	14.98	18.95	17.0	952.9	935.9

R = Reinforced

To determine the amount of general regional scour at Camelback Road the principles of water and sediment continuity are utilized. The hydraulics for the 100-year peak discharge of 95,000 cfs were utilized from the HEC-II water-surface profile program. The sediment transport rates were theoretically determined using a combination of the Meyer-Peter, Muller bed-load transport equation and Einstein's integration of the suspended bed-material load. The sediment transport relations have been applied successfully to numerous sand and gravel bed channels and are considered applicable in the Agua Fria. The general regional scour computed for the constriction at Camelback was 3.2 feet for the 100-year flood.

5.4 Aggradation/Degradation Analysis

The aggradation/degradation response of a river can be quantified through several different methodologies, including an equilibrium slope and armor control process. Proposed channelized reaches from Camelback Road to Buckeye Road were evaluated considering present upstream conditions and future upstream developments.

5.4.1 Estimate of Time Required for Armor Layer to Progress to Camelback Road

Presently there exists a supply of sand from bed and banks upstream of the proposed channelized reach. However, an armor layer of gravel- and cobble-size material is forming on the channel bed of the Agua Fria from Waddell Dam to approximately Bethany Home Road, which is one mile upstream of Camelback Road. Should this armor layer progress to Camelback Road, in combination with the construction of the New River Dam, the sediment supply into the channelized reach will be significantly reduced, thereby resulting in serious degradation problems.

Assuming the bed of the Agua Fria is armored to Bethany Homes Road, and an armor layer develops approximately 5 feet below the present bed elevation near Camelback Road, a volume of 40×10^6 ft^3 of material is available from the bed and banks before armoring occurs from Bethany Home Road to Camelback Road. Using the Meyer-Peter Muller bed-load transport equation in combination with the Einstein suspended sediment procedure, sediment transport rates were determined for the 10-, 25-, 50- and 100-year floods in the reach between Camelback and Bethany Home Road. The number of floods necessary to remove the

volume of material available in the bed and banks for the 10-, 25-, 50- and 100-year floods was 6, 3, 2 and 2, respectively. Thus it will take approximately 25 to 50 years to develop an armor layer depending on the sequence and number of floods that occur. This analysis considers no supply from the upstream reach which is very conservative. In actuality, it will take more floods than these to armor the channel bottom.

Not knowing what the future flows will be on the Agua Fria, the gradient of the channelized reach will be based on present sediment supply rates. The Agua Fria should, however, be monitored upstream of Camelback Road to determine when the armor layer progresses to Camelback Road. Additional grade-control structures may be necessary once this armor layer reaches Camelback Road.

5.4.2 Equilibrium Slope Analysis

The equilibrium channel slope is defined as the slope at which the channel's sediment transport capacity is equal to the incoming sediment supply. Under this condition, the channel neither aggrades nor degrades. The equilibrium slope method is sometimes referred to as the dynamic equilibrium slope because the gradient of the channel continually changes with upstream sediment supply.

The equilibrium slope analysis is usually determined for the dominant discharge in the river, or the discharge that most influences the cross-sectional shape. The dominant discharge is often considered to be the bankfull discharge. However, bankfull discharge is hard to determine and highly variable along the Agua Fria River because of the multiple braids. The 10-year discharge of 31,000 cfs was selected as having the most influence in shaping the channel upstream of Camelback Road, as it has occurred several times in the past, most recently in 1979. The 10-year discharge is within the range of discharges that can be considered bankfull along the Agua Fria.

When establishing the equilibrium slope for downstream channelized reaches, it is important to accurately assess the incoming sediment supply. The reach of the Agua Fria upstream of Camelback Road near the New River was used as the sediment supply reach. This section of the river is very wide and should serve as an excellent control for sediment supply if armoring does not occur.

The existing channel bed above Camelback Road is, however, starting to show evidence of an armor layer developing. Patches of larger sized materials on the bed (1 inch in diameter) are in evidence at the New River confluence. The armor layer gets progressively thicker upstream to Grand Avenue where the river bed is completely filled with gravel and cobbles. The armor layer developed as a result of sediment being trapped by Waddell Dam.

Table 5.4 summarizes for the 10-year discharge of 31,000 cfs the existing thalweg slopes, equilibrium slopes, average hydraulics and sediment transport rates for each reach. The equilibrium slope analysis is based on both levees having adequate bank protection, such that bank erosion will be minimal and any degradation that occurs will originate from the channel bed. Should the banks not be protected and the channel not be maintained in its trapezoidal shape, the channel will not reach the equilibrium slope. Another consideration in determining whether the bed will reach the equilibrium slope is to determine if an armor layer will develop before reaching equilibrium.

5.4.3 Armor Control

The armoring process begins as the nonmoving coarser particles segregate from the finer material in transport. The coarser particles are gradually worked down in the bed, where they accumulate in a sublayer. Fine bed material is removed through this coarse sublayer to augment the material in transport. As movement continues and degradation progresses, an increasing number of nonmoving particles accumulate in the sublayer. This accumulation interferes with the removal of fine material so that the rate of transport over the sublayer is not maintained at its former capacity. Eventually, enough coarse particles accumulate to shield, or "armor," the entire bed surface. When fines can no longer be removed from the underlying bed, degradation is arrested.

The armor layer will form over a long period of time, or during a large event, such as the 100-year flood. With the gradual depletion of upstream sediment supply into the channelized reach, between Camelback Road and Buckeye Road, the armor control process could dictate the future downstream gradient. The question is whether the degradation that would occur before armoring caused it to cease would be too large to be compatible with the channelization.

Table 5.6. Summary of Degradation Depths Using Different Methodologies for Predicting Bed Response.

Reach No.	Dynamic Equilibrium Slope (ft)	Static Equilibrium Slope (ft)	Flat Slope[1] (ft)	Particle Armor Control (ft)
1	2.6	5.2	7.9	11.6
2	7.2	8.5	10.8	11.6
3	2.3	5.3	5.6	11.6
4	3.8	7.7	9.7	11.6
5	7.6	10.4	17.7	11.6
6	1.4	5.1	5.4	11.6
7	0.6*	5.2	9.1	11.6

*Aggradation in this reach.

[1]Flat slope assumes the bed will be horizontal in the reach.

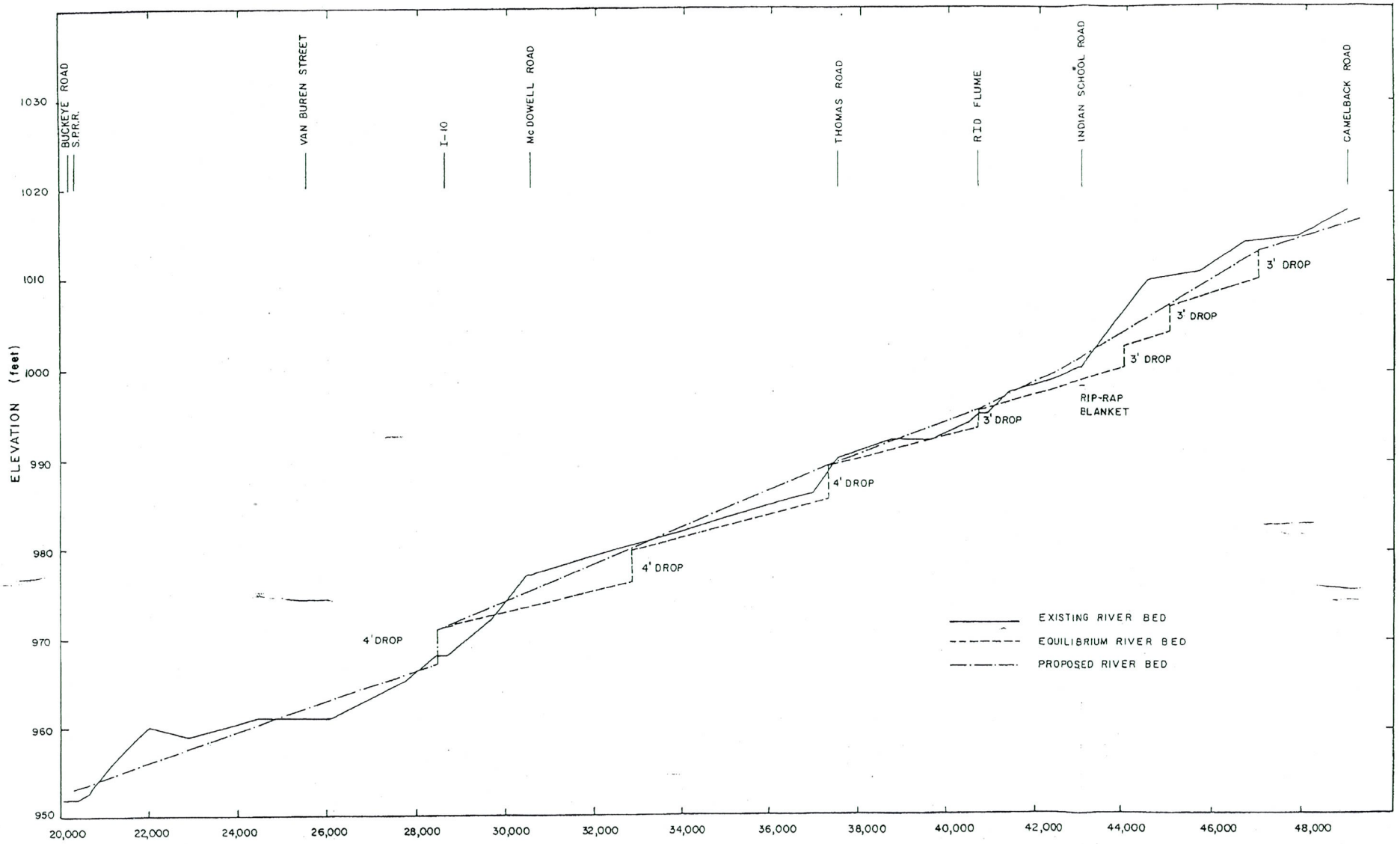


FIGURE 5.2 LOCATION OF PROPOSED DROP STRUCTURES AND EXISTING, PROPOSED AND EQUILIBRIUM BED PROFILES.

First, the existing thalweg profile in reaches 1 and 2 was combined into one reach with an average slope of 0.0030 as shown in Figure 5.2. The grade of 0.0030 between ISRB and Camelback will generate extra material for backfilling of gravel pits downstream of ISRB and for construction of levees. The dynamic equilibrium slope for this reach is 0.0015, which represents approximately 9 feet of degradation potential at Camelback Road should both banks be diked. Three 3-foot drops will be necessary between ISRB and Camelback Road. The approximate locations of drop structures are 1,000 feet, 2,000 feet and 4,000 feet upstream of ISRB.

Should the west bank of the river be partially diked and a dike be constructed on the east bank, the velocities in reaches 1 and 2 will be reduced, sediment will be available for transport from the west bank and the dynamic equilibrium slope for this reach becomes 0.0024. One 3-foot drop structure located 1,000 feet upstream of ISRB will be necessary for this alternative. A larger flowage easement will be required.

For the alternative with a partially diked west bank and 2 transverse dikes on the east bank, no grade control structures are recommended as velocities will reduce considerably for this alternative. The flowage easement required for this alternative is considerably greater than the other alternatives.

The grade control structures are located in areas that maximize protection of existing structures and minimize toe down depths of levees which can be very costly. The locations of grade controls and depth requirements are predicated on the assumption that both levees will have some protection whether it be in the form of riprap or soil cement.

5.5 Total Scour Expected at Major Bridge, Flume and Utility Crossings

The total scour at major bridge, flume and utility crossings can be broken down into the following four components: local scour, general regional scour, general aggradation/degradation response, and bed form heights. Antidunes form on sand-bed channels when the flow enters the upper regime. For discharges approaching and exceeding those of the 10-year peak, upper regime flow conditions exist. Estimates of antidune heights were made by Kennedy (1963) as follows:

$$h = 0.14 \frac{2 \pi V^2}{g} \qquad (5.5)$$

where h is the antidune height

V is the average flow velocity

g is the gravitational constant.

If the calculated antidune height is larger than the depth of flow, the antidune height is set equal to the depth of flow.

Summaries of expected total scour depths at all major bridge and flume crossings are listed in Table 5.7. The general aggradation/degradation response was estimated using the dynamic equilibrium slope and pivoting about proposed grade-control structures.

Based on the summation of the four scour components at the bridge and flume crossings in the Agua Fria, it is recommended that Indian School Road Bridge, RID flume and I-10 bridge piers be protected with riprap to prevent potential damage during the 100-year flood.

The local scour at the Salt River Project and Tucson Electric Power Company transmission towers is excessive enough to require protection. Tables 5.2 and 5.3 summarize scour depths at all towers within the channelization reach.

Several pipeline crossings exist within the proposed channelization. El Paso Gas Company has a 10-inch line located 150 feet upstream of Buckeye Road. The sedimentation analysis indicates the channelization will not affect this line. The city of Avondale has a 16-inch water line crossing the Agua Fria at Thomas Road. Approximately 600 feet of this line will have to be lowered near the west bank. The Southern Pacific Pipeline, Inc. has a 6-inch high pressure gas line crossing the Agua Fria at Thomas Road. The depth of burial of this pipeline will have to be field verified before recommendations regarding relocation are made. Some channelization and degradation will result in a lowering of the channel bed at this pipeline crossing.

Table 5.7. Summary of Total Scour Depths Expected at Major Bridge and Flume Crossings In the Agua Fria for the 100-Year Discharge.

Channel Feature	Depth of Burial of Piers	Local Scour (100-yr Discharge) (ft)	General Regional Scour (ft)	General Aggradation/ Degradation/ (Dynamic Equilibrium) (ft)	One-Half Antidune Height (100-yr Discharge) (ft)	Expected Total Scour (ft)
Camelback Rd. Bridge[1]	70	11.9	3.2	3.4	1.2	19.7
Camelback Rd. Bridge[2]	70	11.9	3.2	0	1.2	16.3
Indian School Road Bridge	25	17.0	---	2.6	0.7	20.3
Roosevelt Irrigation Dist. flume	23-31	13.9	---	0	1.4	15.3
McDowell Road Bridge	70	16.9	---	2.9	1.9	21.7
I-10 Bridge	23	14.1	---	0	0.6	14.7
Southern Pacific Railroad Bridge	30	16.6	---	---	0.9	17.5
Buckeye Road Bridge	28	12.0	---	---	1.1	13.1

[1] Partial levee construction on the west bank of the Agua Fria between Camelback and Indian School Roads.

[2] Complete levee construction on the west bank of the Agua Fria between Camelback and Indian School Roads.

VI. APPLICATION OF MATHEMATICAL MODEL TO DETERMINE AGGRADATION/DEGRADATION RESPONSE OF CHANNELIZATION

6.1 General

To determine the general response of the Agua Fria bed to the 100-year flood, water and sediment routing was performed using QUASED, a sediment routing procedure developed by Simons, Li & Associates, Inc. (SLA).

In using the QUASED model, the main river is subdivided into a series of computational reaches. Each of these subreaches is selected as a portion of the main river where hydraulic and geomorphic characteristics are similar. For this study, each subreach had sediment discharge input from the upstream portion of the main river. Hydraulic conditions for each subreach were calculated using the U.S. Army Corps of Engineers HEC-II water surface profile program.

The general model concept was discussed in the previous report entitled "Hydraulic and Geomorphic Analysis of Agua Fria River" (please refer to this report for descriptions of the model). The QUASED model simulated the 1978, 1979, and 1980 floods as well as the 100-year flood for existing channel conditions. Results of the simulations were discussed in the above referenced report. Sediment routing results for the channelized reaches are discussed in the following section.

6.2 Sediment Routing Results

The bed response of the Agua Fria from the confluence with the Gila River to Glendale Avenue was simulated for the 100-year flood. The channelized reach extends from Camelback Road to Buckeye Road. The thalweg profile is the dynamic equilibrium slope profile as shown in Figure 6.1. Also shown in Figure 6.1 is the simulated bed response to the 100-year flood.

The bed remains fairly stable throughout most of the river. From approximately 2,000 feet upstream of Camelback Road to Camelback Road the bed lowers an average of 2 feet. In the transition area from the natural to the channelized reach, the top width decreases significantly and the velocities increase substantially. The sediment transport rates increase in the transition reach resulting in the 2 foot lowering of the bed. In the reach between Camelback Road and the first grade control structure downstream of Camelback Road, the bed aggrades approximately 1 foot. This aggradation is the result of increased sediment supply from the reach upstream of Camelback

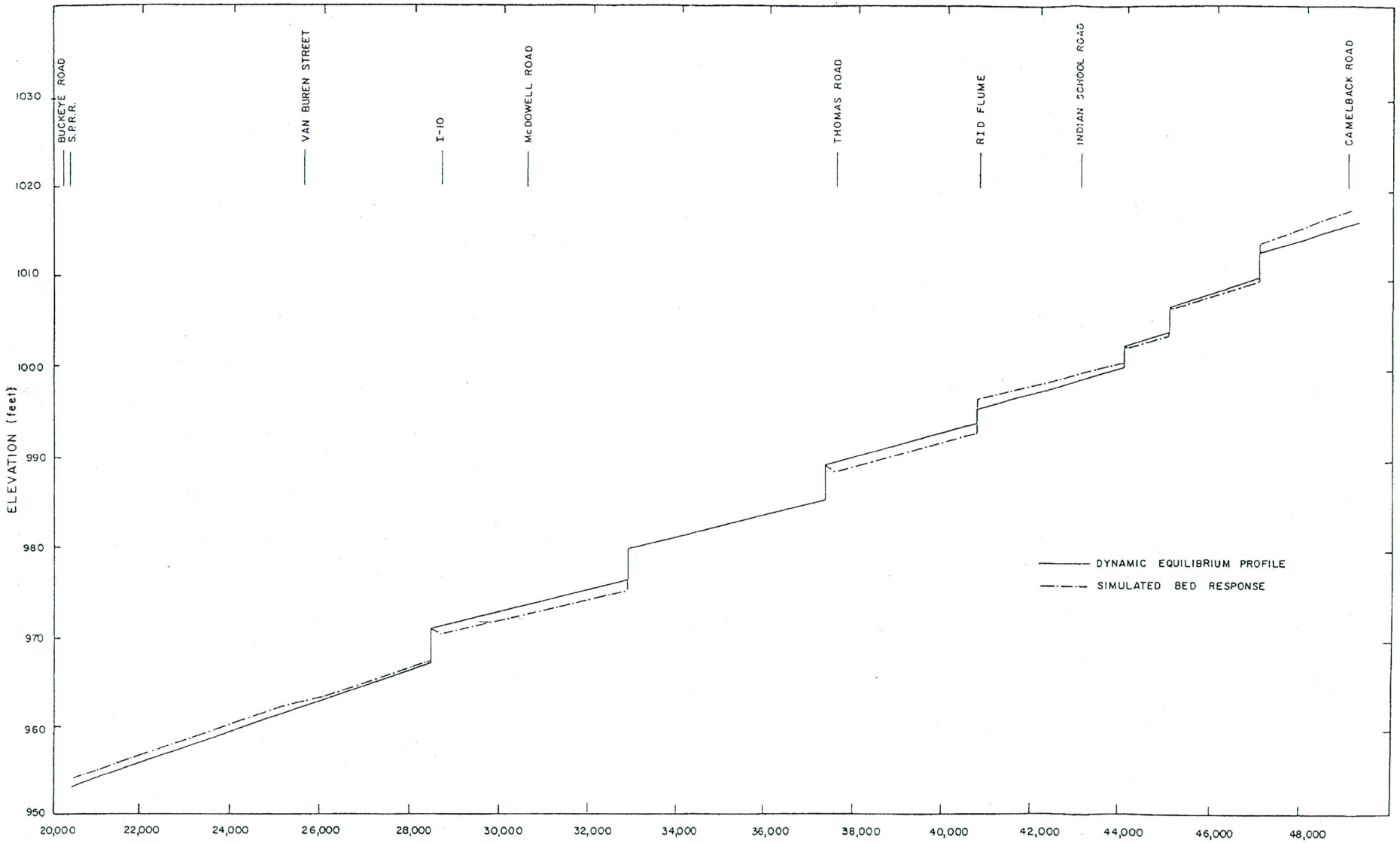


FIGURE 6.1 BED RESPONSE OF AGUA FRIA RIVER TO 100-YEAR FLOOD.

Road. Between the RID Flume and the grade control structure upstream of ISRB, the bed aggrades an average of 1.0 foot. This is due to the excess of sediment supply from the transition reach, and also due to the steeper gradient above the drop structure in the reach upstream of ISRB. All the other reaches in the Agua Fria aggrade or degrade less than 1.0 foot indicating the channel is approaching its equilibrium state.

6.3 Conclusion

QUASED shows that the response of the dynamic equilibrium bed profile to a 100-year flood is minimal, except in the transition reach near Camelback Road. This indicates that slightly deeper toe down depths will be required near Camelback Road. Throughout the channelization reach the bed response neither aggraded nor degraded more than a foot, therefore the equilibrium bed profile is a good estimate of the eventual bed profile. The profile will not be altered significantly by large floods after equilibrium conditions are reached.

VII. HYDRAULIC DESIGN OF BRIDGES

7.1 General

The existing and proposed bridge and flume crossings were analyzed to determine their adequacy to pass the 100-year peak discharge of 95,000 cfs. Considered in the analysis was the water surface elevation computed using HEC-II with no debris blockage at the piers, 10 percent debris blockage and 20 percent debris blockage. Also considered at each of the crossings was any aggradation, computed using the QUASED model, during the peak discharge of the 100-year hydrograph. Finally, a 4-foot freeboard, as required by the Corps of Engineers, or the sum of half the antidune height, superelevation around bends and surface wave height, was added to the water surface elevation, whichever was greater. The proposed bed profile shown in Figure 5.2 was used to determine the water surface profiles. Also shown in Figure 5.2 is the existing thalweg profile and the dynamic equilibrium profile.

7.2 Lateral Migration and Flow Skew at Bridge Crossings

As characteristic of many braided streams, the Agua Fria has a very wide flood plain with multiple low flow channels which tend to migrate significantly within the banks. Examination of the aerial photographs shows the flood plain width has not changed significantly except when altered by man through urbanization, gravel mining or channelization encroachments.

Table 7.1 summarizes the past flood plain widths and approximate skew angle of the low flow channels at the Camelback Road, Indian School Road, RID Flume, McDowell Road, I-10, Southern Pacific Railroad and Buckeye Road crossings. Aerial photographs for the years 1936, 1963, 1974 and 1980 were used to determine flood plain widths.

The flood plain width of 4,300 feet has remained approximately the same at Camelback Road since 1936. The flow angle was 25 degrees from normal at Camelback Road during the February 20, 1980, flood. Spur dikes upstream of Camelback Road in conjunction with channelization should align the flow through the bridge. The lateral migration to the east has historically been negligible and the spur dike, as designed by PRC Toups, will direct any overbank flow on the east bank towards the main channel. The bridge width of 1,725 feet is considerably narrower than the 4,300-foot wide flood plain. A

Table 7.1. Flood Plain Width and Skew Angle Changes at Bridge Site Crossings.

LOCATION	DATE	FLOOD PLAIN WIDTH (ft)	SKEW ANGLE OF LOW FLOW BRAID
Camelback Road	1936	4,300	7
	1963	4,300	0
	1974	4,200	3
	1980	4,300	25
Indian School Road	1936	4,000	25
	1963	3,200	11
	1974	2,700	18
	1980	2,900	45
Roosevelt Irrigation District Flume	1936	3,700	20
	1963	1,700	9
	1974	500	0
	1980	500	0
McDowell Road (upstream of dogleg)	1936	2,500	25
	1963	1,500	40
	1974	1,500	40
	1980	1,600	30
I-10	1936	1,600	10
	1963	1,600	17
	1974	1,600	10
	1980	1,600*	5
Southern Pacific Railroad and Buckeye Road	1963	2,300	9
	1974	2,300	15
	1980	1,500	23

*Flow broke out of dogleg just downstream of McDowell Road and flooded field east of I-10. Water flowed to the east of the partially completed I-10 bridge.

side drainage channel to direct overbank flow from the west braid back into the main channel or a culvert through Camelback Road at the west braid will be necessary to drain the overbank flow. This is discussed further in the next chapter.

For the channelized reaches downstream of Camelback Road, no lateral migration is expected, with the possible exception of the reach between Camelback Road and Indian School Road if levees are not constructed.

At large discharges the skew angle at the bridge crossings should be insignificant due to the channelization aligning the flow. Low flow meanders will still exist and cause some skew of the flow at smaller discharges. This should not cause significant local scour problems at the bridge crossings.

7.3 Low Chord and Flood Passage

Summaries of the water surface elevation at Camelback Road, Indian School Road, Roosevelt Irrigation District Flume, McDowell Road, I-10, Southern Pacific Railroad and Buckeye Road crossings are made in Tables 7.2 through 7.4 for no blockage, 10 percent blockage and 20 percent blockage, respectively. Considering no debris blockage, all seven crossings will pass the 100-year discharge; however, the 4-foot freeboard is not satisfied at Camelback Road, and Southern Pacific Railroad crossings where the freeboard elevations are 2.8 feet and 3.7 feet, respectively.

The freeboard at Camelback Road is slightly misleading as the low chord near the abutments is at elevation 1,026.2 feet; however, at the center of the bridge the low-chord elevation increases to 1,031.2 feet. Thus the average low-chord elevation is 1,028.7 feet, which should provide adequate capacity to pass the 100-year flood and 4 feet of freeboard.

Considering 10 percent and 20 percent debris blockage, the Camelback Road, RID flume and the Southern Pacific Railroad crossings do not possess the 4 feet of freeboard. However, pressure or weir flow does not develop at these three crossings with the 10 and 20 percent blockages. Therefore the bridges should be adequate to pass the 100-year flood, but the margin of safety will be reduced.

The bed elevation at the Southern Pacific Railroad was not lowered as the sedimentation analysis indicated this reach was in an approximate equilibrium condition in response to the 10-year flood, and showed a slight aggradation tendency in the QUASED model. Any flattening of the bed slope in this area would result in deposition and a decrease in the discharge capacity.

Table 7.2. Summary of Required Low Chord at Crossings with no Debris Blockage.

(1) LOCATION OF CROSSING	(2) LOW CHORD ELEVATION (MSL)	(3) HEC-II WATER SURFACE ELEVATION (MSL)	(4) 1/2 ANTIDUNE HEIGHT (FT)	(5) SUPERELEVATION AROUND BEND (FT)	(6) SURFACE WAVE HEIGHT (FT)	(7) AGGRADATION (FT)	(8) 4' OF FREEBOARD IF LESS THAN Σ OF COLUMN 4,5,6 & 7 (FT)	(9) REQUIRED LOW CHORD (MSL)
Camelback Road	1,026.2	1,023.4	1.52	---	0.86	---	4	1,027.4
Indian School Road	1,015.4	1,010.2	0.69	---	0.39	0.8	4	1,014.2
Roosevelt Irrigation District Flume	1,010.0	1,006.0	1.56	---	0.89	1.0	4	1,010.0
McDowell Road	992.5	983.8	1.64	---	0.93	---	4	987.8
I-10	988.51	978.1	0.64	0.43	0.36	---	4	982.1
Southern Pacific Railroad	966.2	962.5	0.94	---	0.53	0.5	4	966.5
Buckeye Road	968.1	961.9	1.05	---	0.59	0.6	4	965.9

Table 7.3. Summary of Required Low Chord at Crossings with 10% Debris Blockage.

(1) LOCATION OF CROSSING	(2) LOW CHORD ELEVATION (MSL)	(3) HEC-II WATER SURFACE ELEVATION (MSL)	(4) 1/2 ANTIDUNE HEIGHT (FT)	(5) SUPERELEVATION AROUND BEND (FT)	(6) SURFACE WAVE HEIGHT (FT)	(7) AGGRADATION (FT)	(8) 4' OF FREEBOARD IF LESS THAN Σ OF COLUMN 4,5,6 & 7 (FT)	(9) REQUIRED LOW CHORD (MSL)
Camelback Road	1,026.2	1,024.0	1.52	---	0.86	---	4	1,028.0
Indian School Road	1,015.4	1,010.6	0.69	---	0.39	0.8	4	1,014.6
Roosevelt Irrigation District Flume	1,010.0	1,006.8	1.56	---	0.89	1.0	4	1,010.8
McDowell Road	992.5	985.0	1.64	---	0.93	---	4	989.0
I-10	988.51	979.4	0.64	0.43	0.36	---	4	983.4
Southern Pacific Railroad	966.2	963.4	0.94	---	0.53	0.5	4	967.4
Buckeye Road	968.1	962.4	1.05	---	0.59	0.6	4	966.4

Table 7.4. Summary of Required Low Chord at Crossings with 20% Debris Blockage.

(1) LOCATION OF CROSSING	(2) LOW CHORD ELEVATION (MSL)	(3) HEC-II WATER SURFACE ELEVATION (MSL)	(4) 1/2 ANTIDUNE HEIGHT (FT)	(5) SUPERELEVATION AROUND BEND (FT)	(6) SURFACE WAVE HEIGHT (FT)	(7) AGGRADATION (FT)	(8) 4' OF FREEBOARD IF LESS THAN Σ OF COLUMN 4,5,6 & 7 (FT)	(9) REQUIRED LOW CHORD (MSL)
Camelback Road	1,026.2	1,024.3	1.52	---	0.86	---	4	1,028.3
Indian School Road	1,015.4	1,011.0	0.69	---	0.39	0.8	4	1,015.0
Roosevelt Irrigation District Flume	1,010.0	1,007.7	1.56	---	0.89	1.0	4	1,011.7
McDowell Road	992.5	986.5	1.64	---	0.93	---	4	990.5
I-10	988.5	980.6	0.64	0.43	0.36	---	4	984.6
Southern Pacific Railroad	966.5	964.6	0.94	---	0.53	0.5	4	968.6
Buckeye Road	968.1	963.3	1.05	---	0.59	0.6	4	967.3

Phreatic surfaces were developed assuming impervious material beneath the levee, which is a very conservative assumption. Casegrandes' method was used to establish the phreatic surface through the embankment for Cases II, III and IV.

Case I, end of construction, was not considered a severe problem because there will be minimal if any cohesive materials in the embankment. Any pore pressures that will develop during compaction in the embankment will dissipate quickly because of the free draining soil.

The rapid drawdown, critical flood stage and steady seepage from full flood stage were analyzed and the factor of safety never dropped below 1.2, 1.5 and 1.5, respectively for each of the cases. These factors of safety are above the minimum factors of safety listed in Table 6.1 of Engineering Manual EM 1110-2-1913 recommended by the Corps of Engineers.

Case IV was analyzed in lieu of Case V. The earthquake loading, Case VI, was ignored because the probability of an earthquake occurring along with a 100-year event is so minute, that it was not considered in the analyses.

8.4.1.3 Drop Structure

A 3-foot drop structure located just downstream of the RID flume is required to control the grade at the flume. The drop structure will be 920 feet wide and the top of the drop will be at elevation 995.5 feet. A reinforced concrete and soil cement drop structure are being considered.

8.4.1.4 Protection of RID Flume

The foundation for the RID flume consists of piers that extended 12 feet below the channel bed in 1929. A recent uncovering of one of the piers in the main channel revealed that the piers were only 3 feet below the channel bed. The piers rest on concrete footings which in turn are supported by concrete piles. The piles vary in length depending on the distance to hardpan but are approximately 17 to 25 feet long. Thus, the total foundation depths range from 23 to 31 feet. Local scour potential for the 100-year flood approaches 14 feet. Due to the uncertainty of burial depths of piles, riprap protection of flume piers is suggested.

The riprap protection should extend 20 feet in all directions around flume piers. A 2.5 foot thick riprap blanket with a 1-foot gravel filter should provide adequate protection. The top of the blanket should be constructed at elevation 995.5.

8.4.1.5 Backfilling of Gravel Pits

Several gravel pits on the east and west overbanks between ISRB and Thomas Road will have to be backfilled before levees can be constructed. On the west overbank Allied Concrete, Inc. has a sludge pond that will have to be drained and backfilled. The volume of fill required for the pit is 40,000 cubic yards.

Directly downstream of the sludge pit and just north of the RID flume is a large gravel pit that has been used by Allied Concrete as a land disposal site. Approximately 170,000 cubic yards of trash material will have to be removed from the proposed levee location. This pit will require approximately 380,000 cubic yards of fill material.

Downstream of the RID flume, on the west overbank, Allied Concrete has a gravel pit that will require 450,000 cubic yards of fill material. On the east overbank just downstream of the RID flume, Phoenix Sand and Rock has a gravel pit that will require 10,000 cubic yards of fill.

8.4.1.6 Cost Estimate Between ISRB and Thomas Road

Table 8.5 compares the costs of design components between ISRB and Thomas Road considering a reinforced concrete drop structure versus a soil cement drop structure below the RID flume. Riprap protection of levees was the only bank protection considered in this reach. Table A.9 in Appendix A summarizes quantities, unit costs and total costs between ISRB and Thomas Road.

8.5 Conceptual Design Between Thomas Road and I-10

8.5.1 General

The following components are considered between Thomas Road and I-10: channelization, levees, two drop structures located 200 feet downstream of Thomas Road and 2,200 feet upstream of the proposed McDowell Road Bridge, protection of eight transmission towers, protection of pipeline crossings near Thomas Road and integration of the I-10 collector channel into the Agua Fria. A separate section detailing the analysis conducted on the I-10 collector

Table 8.5. Preliminary Cost Estimates of Design Components Between Indian School Road and Thomas Road.

ITEM	COST OF REINFORCED CONCRETE DROP STRUCTURE	COST OF SOIL CEMENT DROP STRUCTURE
Channelization	$ 637,435	$ 637,435
Levees (riprap protection)	1,743,240	1,743,240
Drop Structure (reinforced concrete)	772,780	-0-
Drop Structure (soil cement)	-0-	400,780
Gravel Pit Restoration	1,225,000	1,225,000
RID Flume Pier Protection (riprap blanket)	90,170	90,170
Transmission Tower Protection	200,000	200,000
Land Acquisition	770,000	770,000
SUBTOTAL	$5,438,625	$5,066,625
10% contingencies and construction supervision	543,860	506,660
TOTAL	$5,982,485	$5,573,285

channel is provided in Appendix B.

8.5.1.1 Channelization

Plates 2 and 3 show the channel alignment between Thomas Road and I-10. The channel width is 1,100 feet between Thomas Road and McDowell Road and expands to 1,410 feet at I-10. The proposed bed slope from I-10 to the drop structure located 2,200 feet upstream of the proposed McDowell Road Bridge is 0.002, and from this drop structure to the drop structure located 200 feet downstream of Thomas Road the proposed bed slope is 0.0021. Approximately 280 acres of right-of-way are required for this alignment. Figure 8.13 shows the proposed bed profile from I-10 to Thomas Road.

8.5.1.2 Levees

Figures 8.13 and 8.14 show levee heights and toe down depths between Thomas Road and I-10 for the east and west banks, respectively. Levee heights range from 10 feet to 12.5 feet and toe down depths range from 8 feet to 12 feet on the east bank. On the west bank, approximately 1,200 feet upstream of the I-10 bridge, a rather severe bend begins and extends through the I-10 bridge ending about 2,000 feet downstream of the bridge. Velocities will increase on the outside of this bend causing increased degradation to occur near the toe of the levee. Also superelevation around the bend will increase flow depths, necessitating an increase in freeboard height above the 100-year water surface. Required levee heights increase to approximately 8 feet above the 100-year water surface around the bend because 1/2 the antidune height and the superelevation around the bend sum to 8 feet. Toe down depths are extended 15 feet below the equilibrium bed profile due to the increased degradation potential.

The levees will have 3:1 riverside slopes if protected with riprap and 1:1 riverside slopes if protected with soil cement. Landside slopes of 3:1 to natural ground are recommended. Crown widths of the levees will be 15 feet. It is recommended that soil cement protection be used on the west bank between McDowell and I-10 because of the large flow velocity increase around the bend and the subsequent large increase in riprap sizes needed to stabilize the bank.

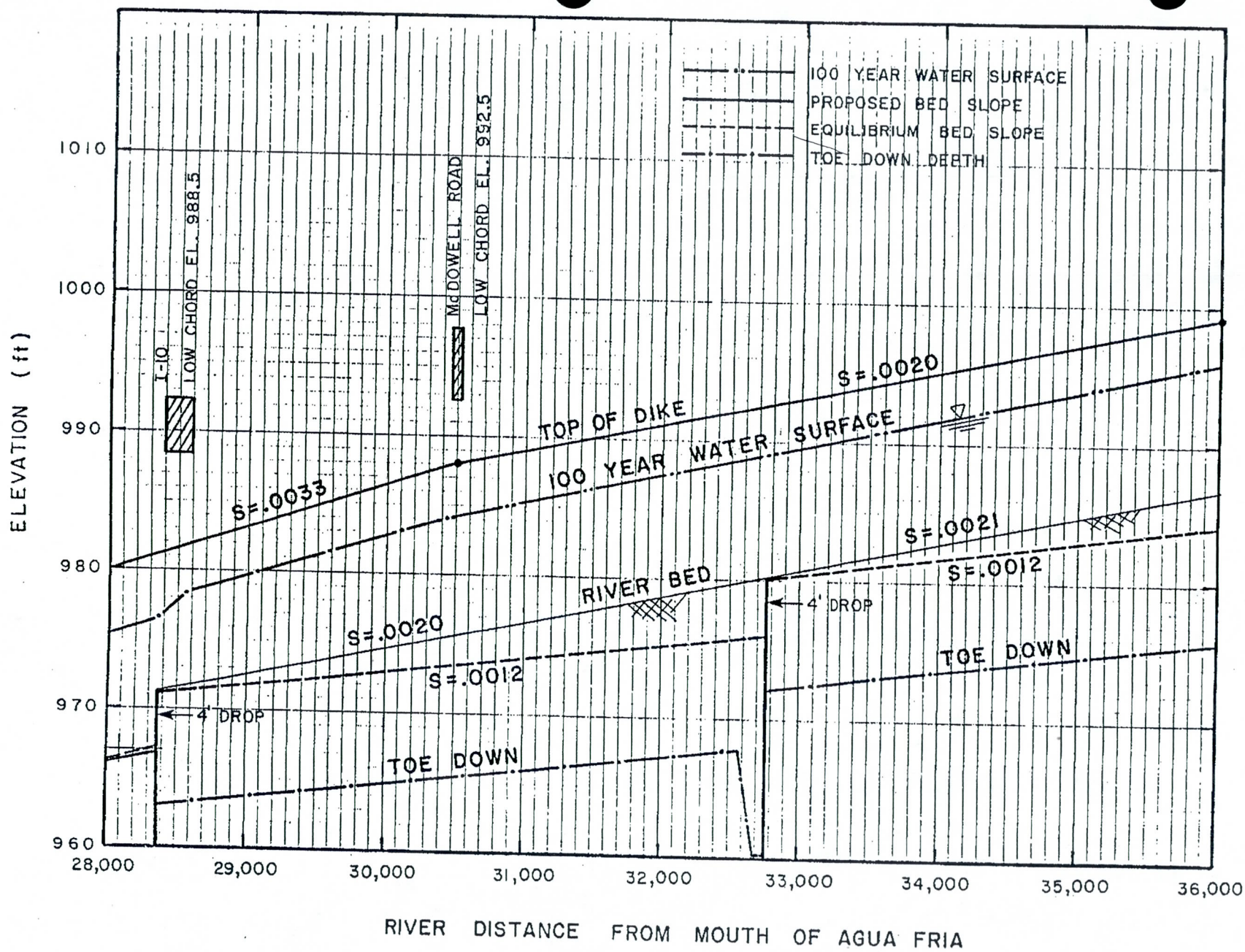


Figure 8.13. Proposed bed profile, equilibrium bed profile, levee heights and toe down depths between I-10 and Thomas Road for east bank.

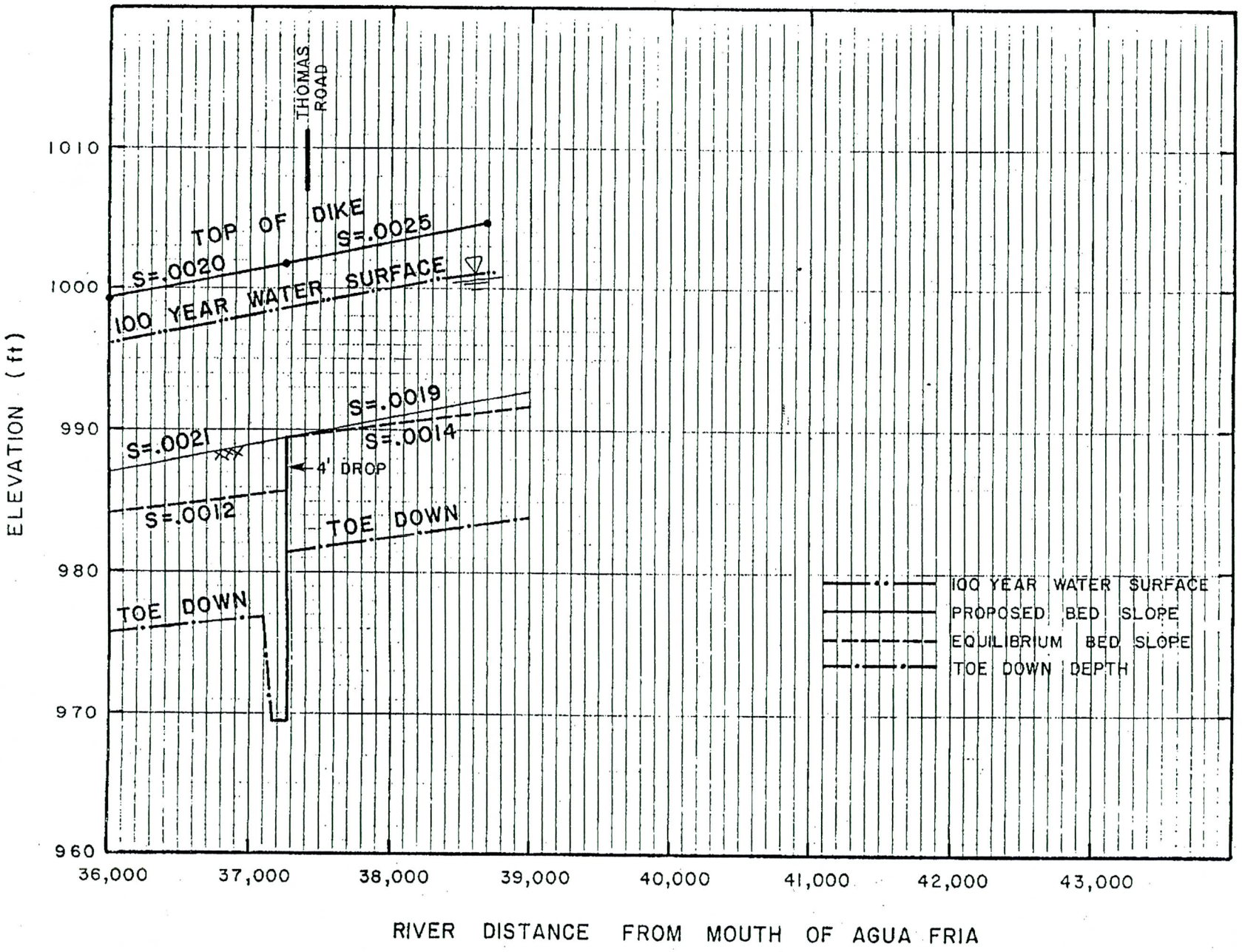


Figure 8.13. (Continued)

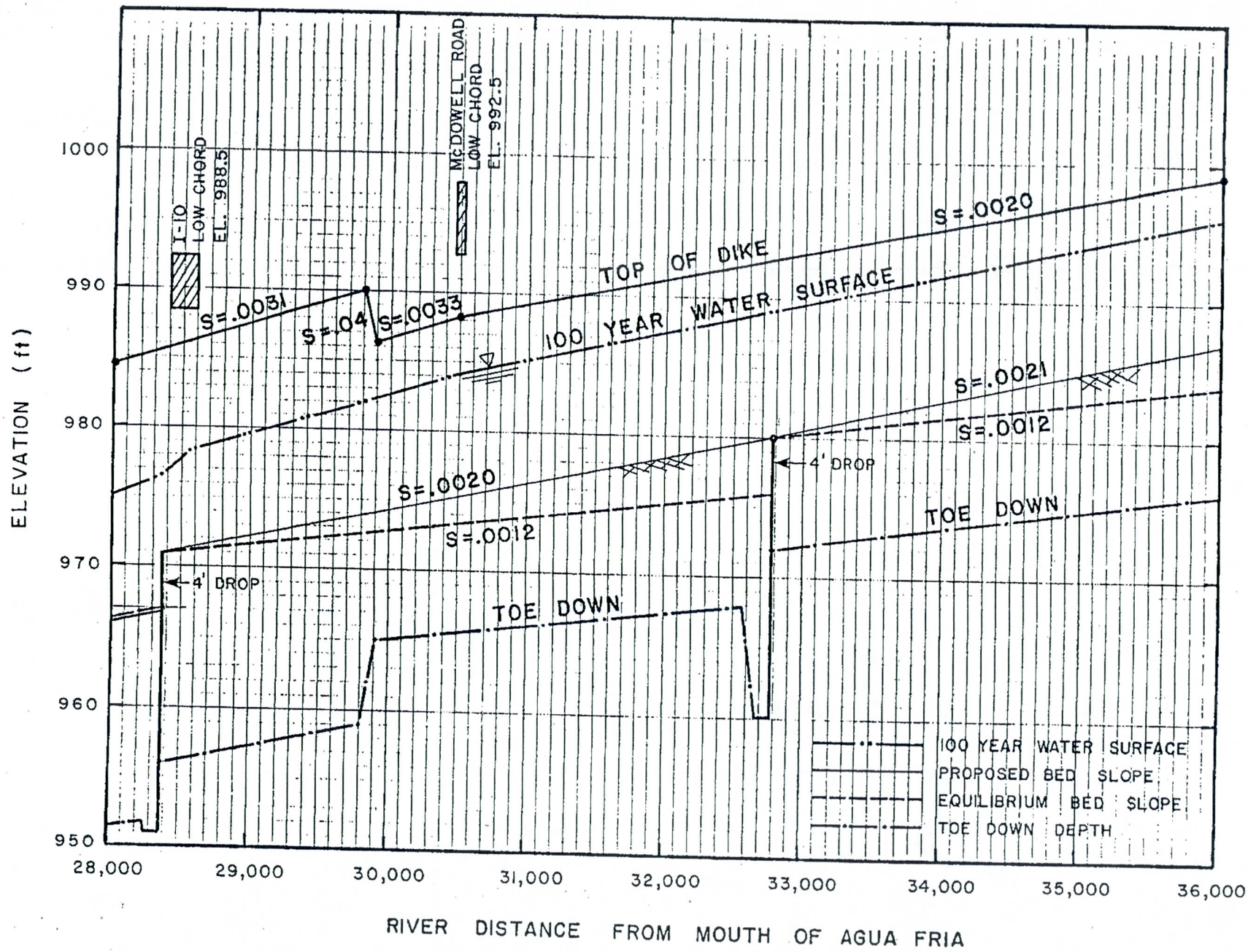


Figure 8.14. Proposed bed profile, equilibrium bed profile, levee heights and toe down depths between I-10 and Thomas Road for west bank.

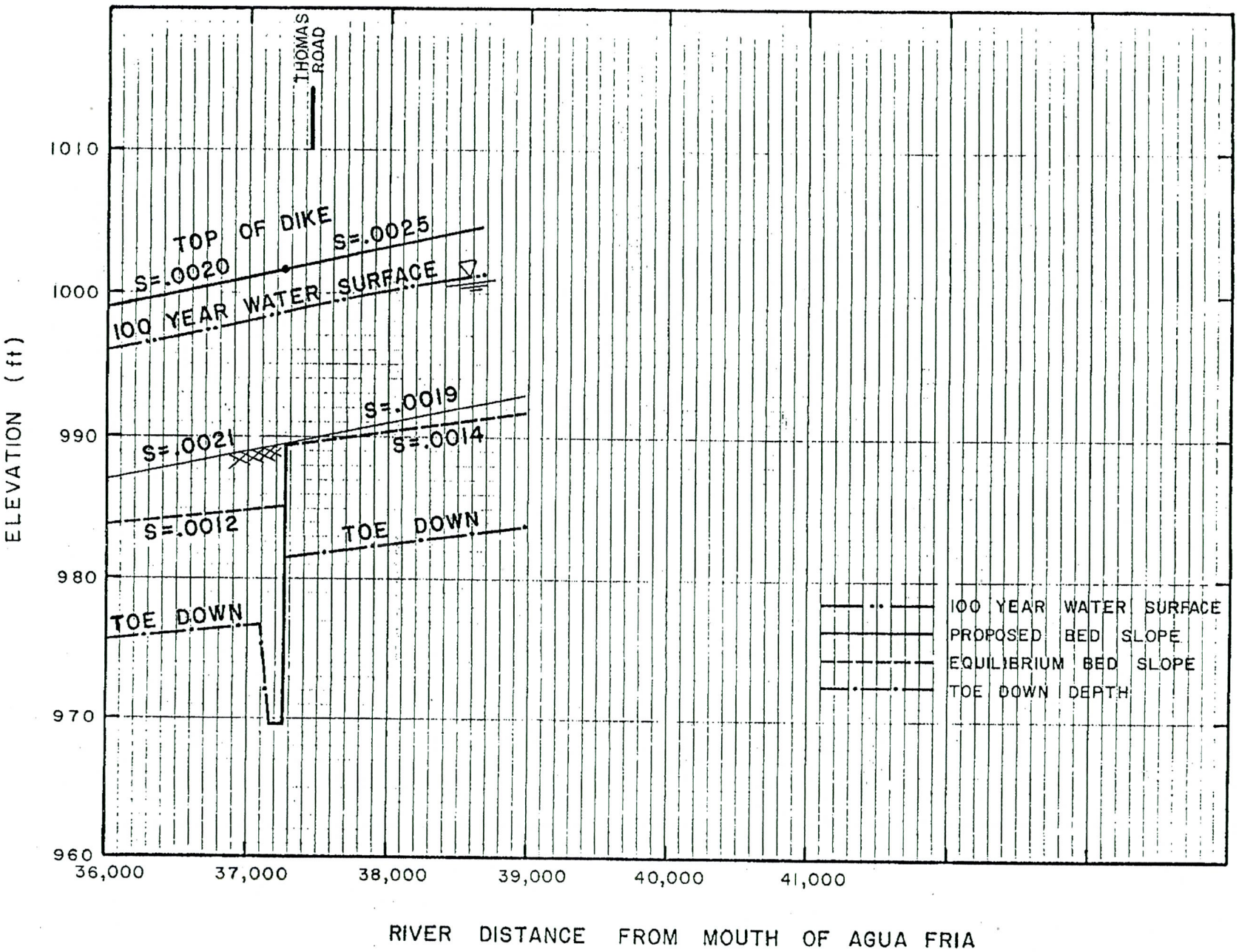


Figure 8.14. (Continued)

If riprap protection is selected, 2-foot thick riprap will provide the necessary protection against flow velocities in this reach except around the bend on the west bank. Should riprap be installed on the west bank around the bend, the D_{50} riprap size increases to 28 inches with a maximum size of 56 inches. Selecting a filter that will remain intact between the riprap and natural soil, with this large a difference in gradations, becomes almost impossible. Therefore soil cement is recommended for protection of the bend and is used in the cost estimate.

8.5.1.3 Drop Structures

Two 4-foot drop structures are needed between I-10 and Thomas Road. The locations of drop structures are 2,200 feet upstream of the proposed McDowell Road Bridge and 200 feet downstream of Thomas Road. The eventual equilibrium slope in this reach is 0.0012 with the proposed channelization and the existing grade is approximately 0.0021. Thus, the potential degradation in this reach is approximately 8 feet.

The drop structure located 200 feet downstream of Thomas Road will help stabilize the grade near Thomas Road. This will provide protection for the 16-inch water pipe line and 6-inch high pressure gas pipe line. However, portions of these lines will have to be lowered due to the channel bed being lowered in this vicinity.

8.5.1.4 I-10 Collector Channel

The I-10 collector channel ends approximately 2,900 feet from the proposed levees between McDowell Road and I-10. Presently, the collector channel empties into a 40-foot wide pilot channel, which carries water into the Agua Fria. Three alternatives are being considered for carrying the flows from the I-10 collector into the Agua Fria.

Alternative 1 would leave the collector channel and pilot channel as they presently exist. The east bank levee from McDowell Road will be extended to the pilot channel, and the spur dike just north of the I-10 bridge will be left intact. Approximately 200 feet will be open between the spur dike and upstream levee. Protection of the backside of the spur dike or grading behind the spur dike to prevent ponding of water and 1,000 feet of protection on the backside of the levee is necessary. Inherent with this alternative is the inundation of land in back of the levee between McDowell Road and I-10 when

the Agua Fria flows bank full. Likewise, that area could also be inundated when higher flows occur in the I-10 channel. Approximately 20.6 acres of land shown in Figure 8.15, in addition to the right of way acquired by the Arizona Department of Transportation (ADOT) for I-10, will be subjected to flooding when the 100-year discharge occurs from the I-10 collector channel. Also inherent with this alternative is a headcut potential between the spur dike and levee. Should material erode from the pilot channel and deposit in the Agua Fria, a reduction in flow capacity results and forces an uneven flow distribution at I-10, which can cause additional scour. Therefore, maintenance will have to be performed if bars or islands form in this area.

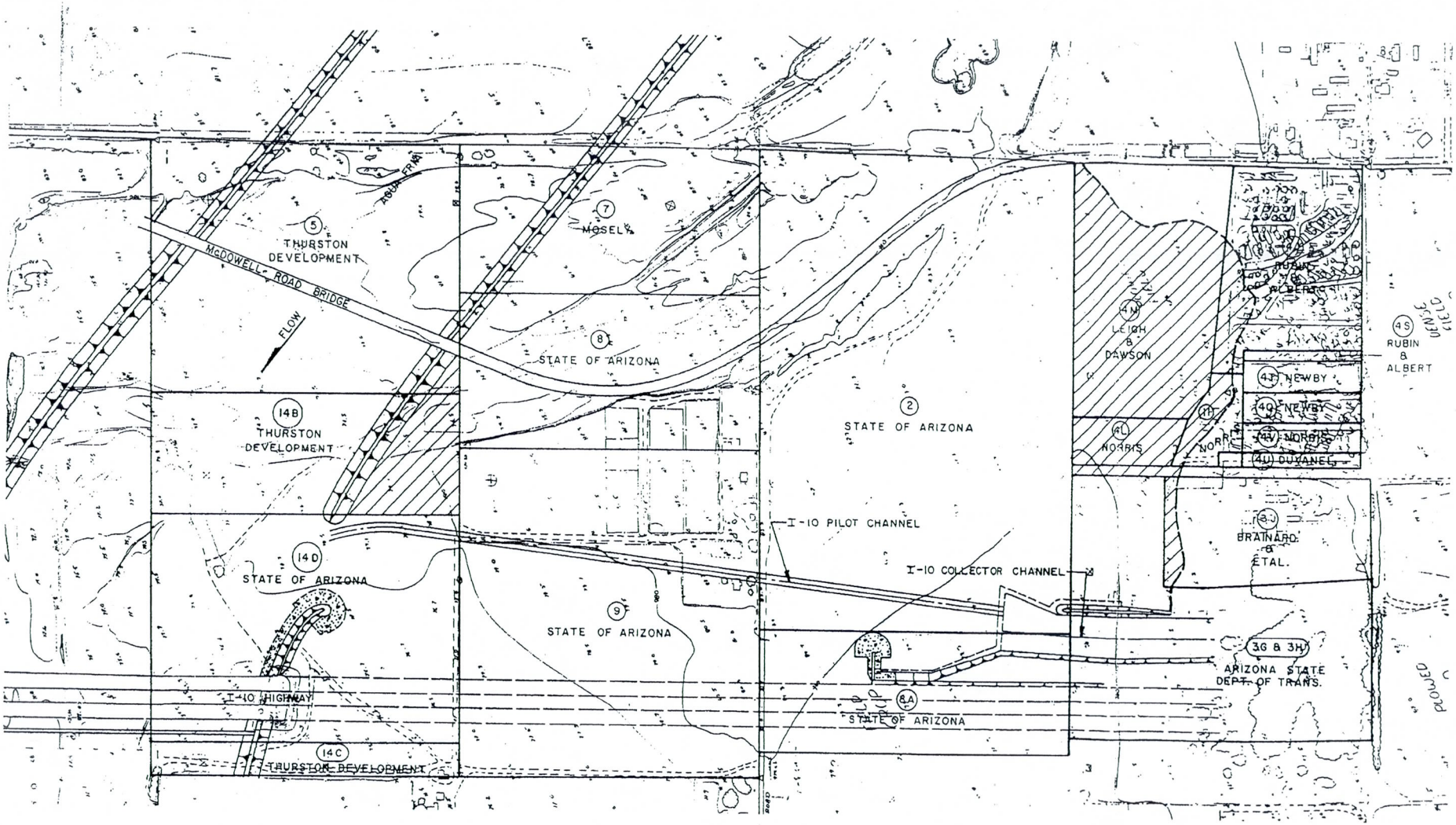
Riprap could be used to stabilize the area, however (1) the expense is very prohibitive and (2) if the riprap gets exposed at the river-channel juncture, local waves and vorticity problems can become severe.

Alternative 2 considers extending the I-10 collector channel 2,900 feet to the Agua Fria. The channel will be trapezoidal in shape with a bottom width of 165 feet and have 2:1 side slopes. The channel will have an earth bottom and soil cement protection of banks. The banks of the channel will be extended to contain the 100-year discharge from the collector channel, and contain the 100-year water surface from the Agua Fria. The spur dike will be modified slightly to be in the shape of the levee upstream. Figure 8.16 shows an overview of Alternative 2.

The third alternative considered constructing a siltation basin between the collector channel and the Agua Fria. Figure 8.17 shows an overview of the alternative. The east levee between McDowell and I-10 will have a depressed section 500 feet wide. The depressed section in the levee will contain the 50-year return flow in the Agua Fria. The siltation basin between the collector channel outlet and the Agua Fria will store approximately 300 acre-feet, which is considerably less than the 100-year volume of 1,710 acre-feet; however, it should be large enough to handle a majority of nuisance flows.

Approximately 13.5 acre-feet of sediment per year will be generated from the I-10 collector channel. Periodic maintenance of the siltation basin will be required to maintain its full storage capacity for large floods.

It is suggested that a culvert be placed at the bottom of the depressed section of the levee to allow for evacuation of water from the siltation basin after rain events. It is also suggested that the fill material of I-10 be tested for its suitability as an embankment for the siltation basin.



100-YEAR FLOOD PLAIN NOT OWNED BY THE STATE OF ARIZONA

100-YEAR FLOOD PLAIN FROM I-10 COLLECTOR CHANNEL

FIGURE 8.15 ALTERNATIVE 1 FOR I-10 COLLECTOR CHANNEL

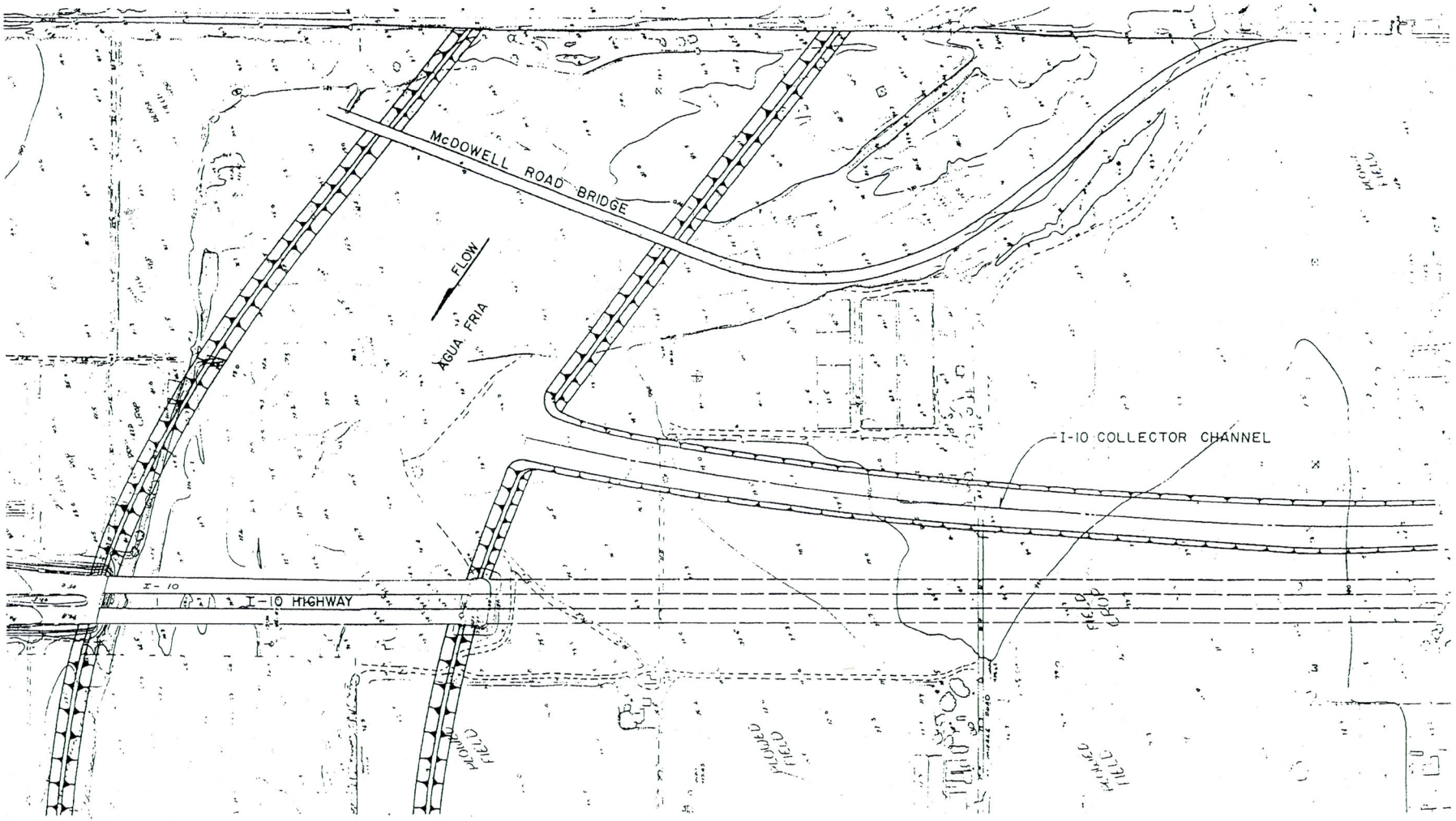


FIGURE 8.16 ALTERNATIVE 2 FOR I-10 COLLECTOR CHANNEL

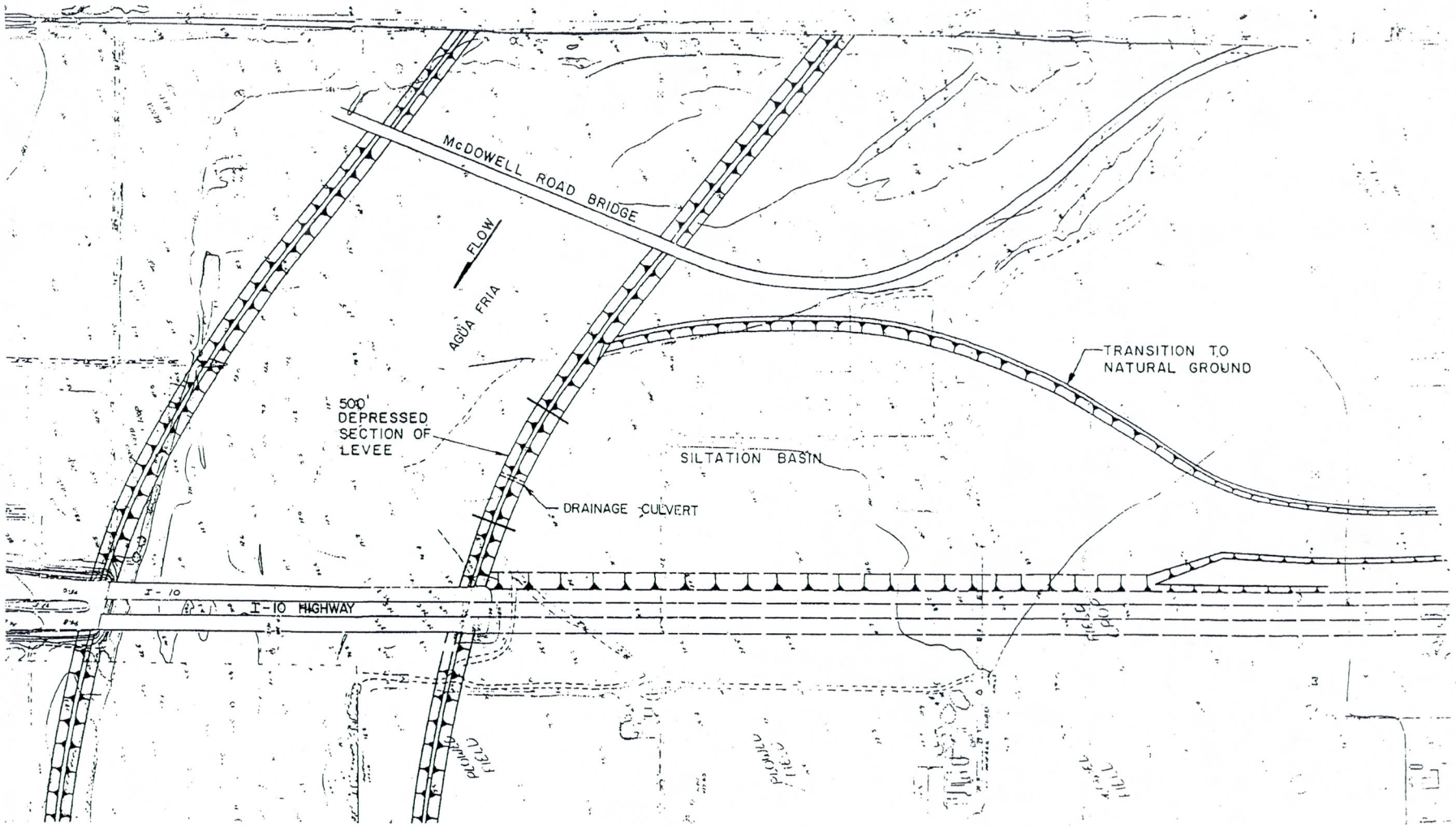


FIGURE 8.17 ALTERNATIVE 3 FOR I-10 COLLECTOR CHANNEL

The approximate costs of Alternatives 1, 2 and 3 are $108,000, $810,000 and $583,000, respectively. Alternative 1 is used for the cost estimate between Thomas Road and I-10.

8.5.1.5 Cost Estimate Between Thomas Road and I-10

Table 8.6 compares the costs of protecting the levees and drop structures with riprap except around the west bend between McDowell and I-10 bridge which is protected with soil cement and constructing two reinforced concrete drop structures with the cost of protecting the levees with soil cement, protecting the drop structures with riprap and constructing two soil cement drop structures, between Thomas Road and I-10. Leaving a 200 foot opening between the levee and spur dike on the east bank for the I-10 drainage was used for both cases in the cost estimate. Tables A.10 and A.11 in Appendix A summarize the quantities, unit costs and total costs for the cases mentioned.

8.6 Conceptual Design Between I-10 and Buckeye Road

8.6.1 General

The following components are considered between I-10 and Buckeye Road: channelization, levees, one drop structure located downstream of I-10, I-10 bridge pier protection, backfilling of abandoned gravel pits just north of Van Buren and protection of seven transmission towers.

8.6.1.1 Channelization

Plates 3 and 4 show the channel alignment between I-10 and Buckeye Road. The channel width is 1,410 feet between I-10 and Van Buren gradually transitioning to 1,100 feet at Buckeye Road. The proposed bed slope in this reach is 0.0017 which is approximately the existing slope. Three hundred acres of channel right-of-way are required for the proposed alignment. Figure 8.18 shows the proposed bed profile.

8.6.1.2 Levees

Figures 8.18 and 8.19 show required levee heights and toe down depths between I-10 and Buckeye Road for the east and west banks, respectively. Levee heights on the east bank range from 10.5 feet to 14.5 feet and toe down depths range from 7 feet to 11.5 feet. Levee heights extend 8 feet above the 100-year water surface and toe down depths extend 15 feet below the

Table 8.6. Preliminary Cost Estimate of Design Components Between Thomas Road and I-10.

ITEM	COST OF RIPRAP PROTECTION FOR LEVEES AND TWO REINFORCED CONCRETE DROP STRUCTURES	COST OF SOIL CEMENT PROTECTION FOR LEVEES AND TWO SOIL CEMENT DROP STRUCTURES
Channelization	$1,680,300	$1,680,300
Levees (riprap protection)	2,958,365	-0-
Levees (soil cement protection)	-0-	2,974,350
Drop Structures (reinforced concrete)	1,817,820	-0-
Drop Structures (soil cement)	-0-	942,080
I-10 Collector Channel	108,000	108,000
Transmission Tower Protection	800,000	800,000
Land Acquisition	1,400,000	1,400,000
SUBTOTAL	$8,764,485	$7,904,730
10% contingencies and construction supervision	876,450	790,470
TOTAL	$9,640,935	$8,695,200

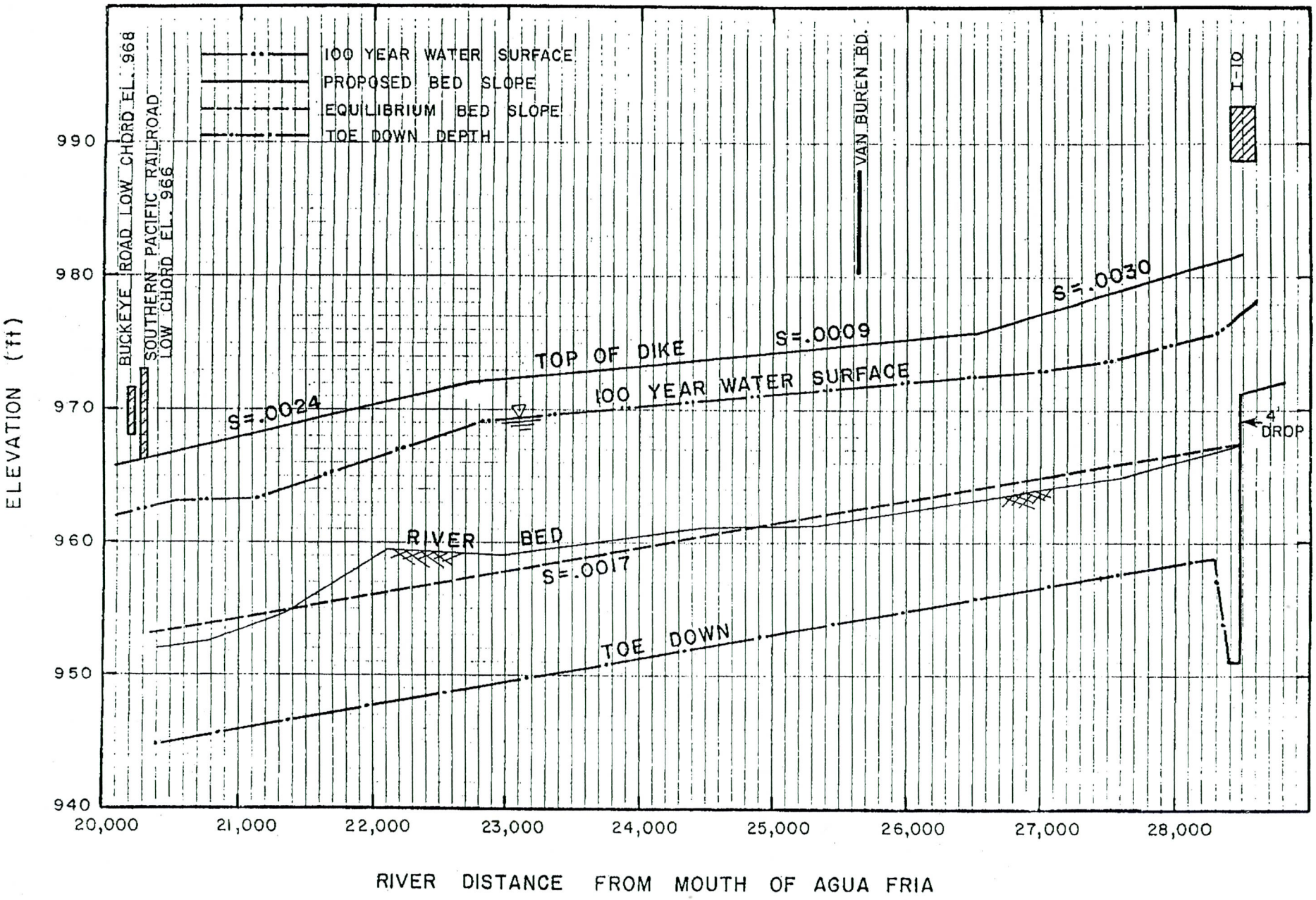


Figure 8.18. Proposed bed profile, equilibrium bed profile, 100-year water surface, levee heights and toe down depths between Buckeye Road and I-10.

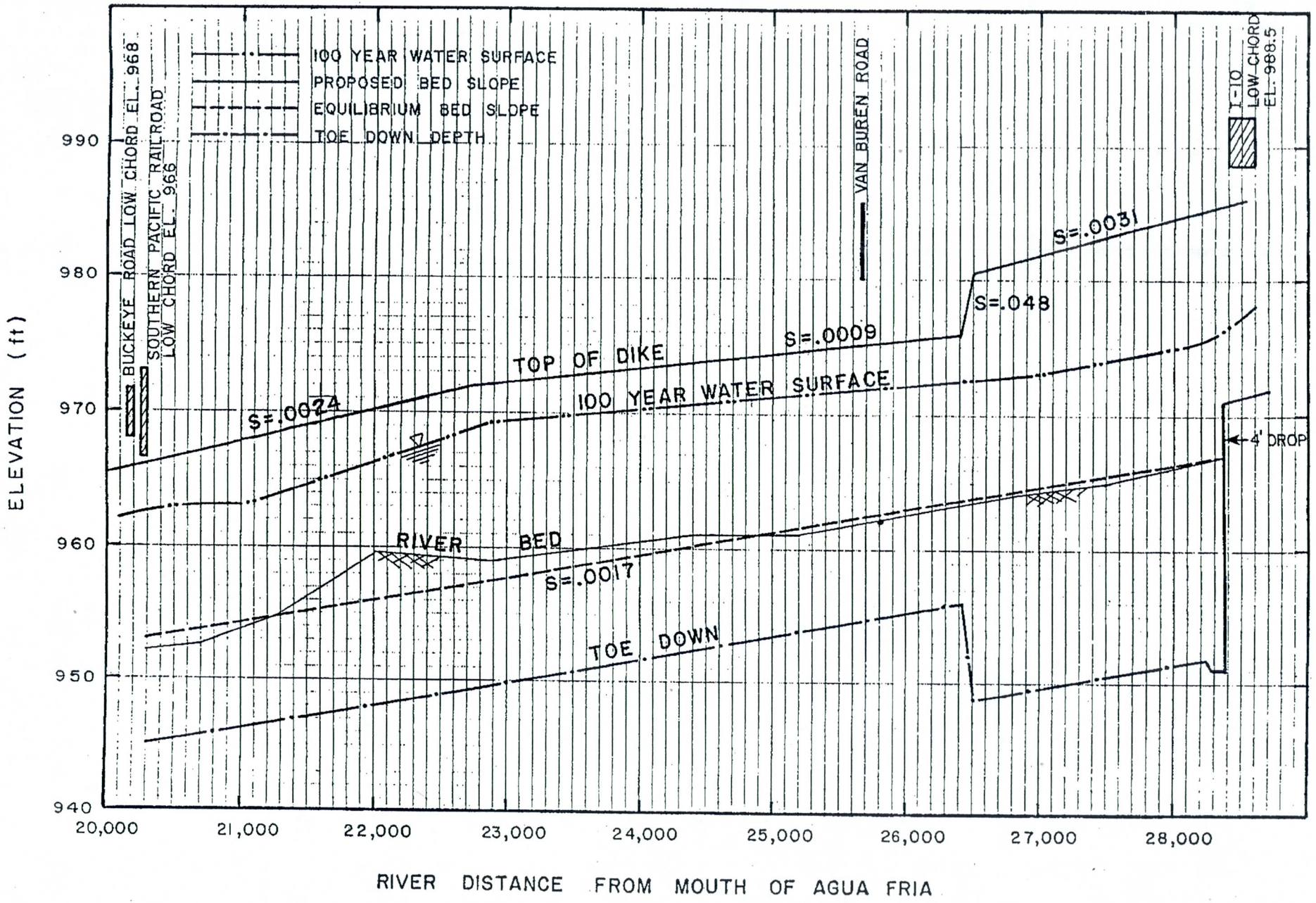


Figure 8.19. Proposed bed profile, equilibrium bed profile, 100-year water surface, levee heights and toe down depths between Buckeye Road and I-10 for west bank.

equilibrium bed slope on the west bank from I-10 to 2,000 feet downstream of the bridge. The levees will have 3:1 riverside slopes if protected with riprap and 1:1 riverside slopes if protected with soil cement. The outside bend of the west bank should be protected with soil cement near I-10. Landside slopes of 3:1 to natural ground are recommended. Crown widths of the levees will be 15 feet.

If the levees are protected with riprap, a 2-foot thickness will provide adequate protection against expected flow velocities in this reach except on the outside bend near I-10.

8.6.1.3 Drop Structure

One 4-foot drop structure located downstream of the I-10 bridge is recommended to control the grade near the bridge. The top of the drop structure will be at elevation 971 and the width of the drop will be approximately 1,410 feet.

The grade control structure should not be constructed until the instream gravel pits located 1,500 feet downstream of the bridge are backfilled. A headcut progressing upstream from the gravel pits could cause the channel bed to lower more than the equilibrium bed slope would indicate, thereby possibly undermining the drop structure.

8.6.1.4 I-10 Bridge Pier Protection

The I-10 bridge piers extend approximately 23 feet below the present thalweg elevation. The piers are circular in shape and have a diameter of 3.33 feet. The computed local scour depth for the piers was 14.1 feet at the 100-year peak discharge of 95,000 cfs and the general bed response near the bridge is slight degradation. For the pre-project conditions the local scour depth for the 100-year discharge is 12 feet and the general bed response is slight degradation. Thus the channelization slightly increases the scour potential at the bridge.

A rather sharp bend exists in the proposed channel between McDowell Road and I-10 due to the locations of the two bridge crossings. The bend may result in several hundred feet of the eastern portion of the bridge becoming an ineffective flow area. The unit width discharge near the west section of the bridge will increase resulting in larger velocities than predicted in HEC-II and a larger local scour potential.

Further compounding the problem in this area is the deposition of sediment along the east bank of the Agua Fria River from the I-10 collector channel. Should the deposition at the river-collector channel juncture become significant, the flow may become further entrenched in the west section under the bridge. Therefore, protection of the I-10 bridge piers is recommended.

A riprap blanket extending 20 feet in all directions around the piers is suggested. The thickness of the blanket is 2.5 feet and the top of the blanket should be at elevation 971. A 1-foot gravel filter blanket beneath the riprap meeting ADOT standards is necessary.

8.6.1.5 Backfilling of Gravel Pits

Several abandoned instream gravel pits will have to be backfilled before channelization occurs in this reach. Two large pits located approximately 1,500 feet downstream of I-10 have volumes of 96,000 cubic yards and 74,000 cubic yards, respectively. These pits extend the full width of the channel.

8.6.1.6 Cost Estimate Between I-10 and Buckeye Road

Table 8.7 compares the costs of protecting the levees, drop structure and I-10 bridge piers with riprap except around the outside bend on the west bank near I-10 which will be protected with soil cement, and constructing a reinforced concrete drop structure downstream of I-10 against the costs of protecting the levees with soil cement, protecting the drop structure and I-10 bridge piers with riprap and constructing a soil cement drop structure downstream of I-10. Tables A.12 and A.13 in Appendix A summarize the quantities, unit costs and total cost for both cases mentioned above for the reach between I-10 and Buckeye Road.

8.7 Summary of Costs

To summarize the costs of channelization in the Agua Fria between Camelback and Buckeye Roads, the river was divided into the following reaches:

1. Camelback Road to Indian School Road
2. Indian School Road to Thomas Road
3. Thomas Road to I-10
4. I-10 to Buckeye

Table 8.7. Preliminary Cost Estimates of Design Components Between I-10 and Buckeye Road.

ITEM	COST OF RIPRAP PROTECTION FOR LEVEES AND A REINFORCED CONCRETE DROP STRUCTURE	COST OF SOIL CEMENT PROTECTION FOR LEVEES AND A SOIL CEMENT DROP STRUCTURE
Channelization	$ 243,000	$ 243,000
Levees (riprap protection)	2,596,375	-0-
Levees (soil cement protection)	-0-	2,634,250
Drop Structure (reinforced concrete)	1,155,680	-0-
Drop Structure (soil cement)	-0-	597,405
Gravel Pit Restoration	212,500	212,500
I-10 Bridge Pier Protection (riprap blanket)	437,210	437,210
Transmission Tower Protection	700,000	700,000
Land Acquisition	1,500,000	1,500,000
SUBTOTAL	$6,844,765	$6,324,365
10% contingencies and construction supervision	684,480	632,440
TOTAL	$7,529,245	$6,956,805

Also considered in the costs were the channel modifications upstream of Camelback Road.

Table 8.8 summarizes costs of channelization between Camelback and Buckeye Roads considering Alternative 1 in Reach 1 for the following two cases: (1) riprap protection of all levees except around the west bend of the channel near I-10 bridge and construction of reinforced concrete drop structures, and (2) soil cement protection of all levees except in Reach 2, where riprap protection will be used and construction of soil cement drop structures. Included in the costs is an additional ten percent for contingencies.

Table 8.9 summarizes costs of channelization between Camelback and Buckeye Roads for Alternative 2 in Reach 1 for the two cases in Table 8.8. Table 8.10 summarizes costs of channelization between Camelback and Buckeye Roads for Alternative 3 in Reach 1 for the two cases in Table 8.8.

Table 8.8. Summary of Costs Per Reach for Channelization Between Camelback Road and Buckeye Road for Alternative 1 in Reach 1.

REACH NO.	APPROXIMATE COSTS CASE I	APPROXIMATE COSTS CASE II
Upstream of Camelback	$ 6,150	$ 6,150
1	5,490,005[1]	4,851,640[1]
2	5,982,485	5,573,285
3	9,640,935[2]	8,695,200[2]
4	7,529,245	6,956,805
TOTAL	$28,648,820	$26,083,080
Approximate Cost per Mile	5,729,800	5,216,600

CASE I - Riprap protection of all levees, except the west bend near I-10 which will be protected with soil cement, and construction of reinforced concrete drop structures.

CASE II - Soil cement protection of all levees, except in Reach 2 where riprap protection is required, and construction of soil cement drop structures.

[1]Does not include cost of 73 acres of flowage easement.

[2]Does not include cost of 20.6 acres of flowage easement.

Table 8.9. Summary of Costs Per Reach for Channelization Between Camelback Road and Buckeye Road for Alternative 2 in Reach 1.

REACH NO.	APPROXIMATE COSTS CASE I	APPROXIMATE COSTS CASE II
Upstream of Camelback	$ 1,008,375	$ 959,615
1	8,765,345	6,741,770
2	5,982,485	5,573,285
3	9,640,935[1]	8,695,200[1]
4	7,529,245	6,956,805
TOTAL	$32,926,385	$28,926,675
Approximate Cost per Mile	6,585,300	5,785,300

CASE I - Riprap protection of all levees, except the west bend near I-10 which will be protected with soil cement, and construction of reinforced concrete drop structures.

CASE II - Soil cement protection of all levees, except in Reach 2 where riprap protection is required, and construction of soil cement drop structures.

[1]Does not include cost of 20.6 acres of flowage easement.

Table 8.10. Summary of Costs Per Reach for Channelization Between Camelback Road and Buckeye Road for Alternative 3 in Reach 1.

REACH NO.	APPROXIMATE COSTS CASE I	APPROXIMATE COSTS CASE II
Upstream of Camelback	$ 6,150	$ 6,150
1	2,667,370[1]	2,852,760[1]
2	5,982,485	5,573,285
3	9,640,935[2]	8,695,200[2]
4	7,529,245	6,956,805
TOTAL	$25,826,185	$24,084,200
Approximate Cost per Mile	5,165,200	4,816,800

CASE I - Riprap protection of all levees, except the west bend near I-10 which will be protected with soil cement, and construction of reinforced concrete drop structures.

CASE II - Soil cement protection of all levees, except in Reach 2 where riprap protection is required, and construction of soil cement drop structures.

[1]Does not include cost of 590 acres of flowage easement.

[2]Does not include cost of 20.6 acres of flowage easement.

Bridge Inspection Report Information
Agua Fria River Bridge Eastbound I-10
Structure No. 1852

Source: ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION

BRIDGE GROUP

Structure Inventory & Appraisal

Structure Number: 1852 Structure Name: Agua Fria Riv Br EB
Route: 10 MP 130 Road Name: I 10; EB Agency: ADOT
Feature Under: Agua Fria River
Location: 19.2 mi W Jct I 17

LOCATION INFORMATION

N1-State Code:	049
N2-State Hwy District:	78
N3-County Code:	013
N4-Place Code:	00013
N16-Latitude:	33 deg 27.4 min
N17-Longitude:	112 deg 20.2 min
N98-Border St Code - % Resp:	- 0
N99-Border Bridge Number:	

INVENTORY ROUTE DATA

N19-Detour Length (miles):	1
N20-Toll:	3
N28-Lanes On / Under:	3 / 0
N5-Inv Rte:	1 1 1 00010 2 -
N10-Inv Rte Min Vert Clr (feet):	99.99
N11-Inv Rte Milepoint:	130
N26-Functional Class:	11
N29-Avg Daily Traffic:	35880
N30-Year of ADT:	2002
N47-Inv Rte Tot Horiz Clr (feet)	58
N100-Defense Hwy:	1
N101-Parallel Bridge:	R
N102-Direction of Traffic:	1
N104-Hwy System:	1
N109-Percent Truck Traffic:	44
N110-National Truck Network:	1
N114-Future ADT:	35880
N115-Year of Future ADT:	2020
A200-Is N5 the Princ. Rte?	Y

RESPONSIBILITY

N21-Maint Responsibility:	01
N22-Bridge Owner:	01
A203-ADOT Org Number:	7871
A224-Insp Team Number:	1
A229-Agency:	ADOT

NAVIGATION

N38-Navigation Control:	0
N39-Nav Vert Clr (feet):	0
N40-Nav Horiz Clr (feet):	0
N111-Nav Pier/Abut Prot:	
N116-Nav Min Vert Clr (feet):	0

GENERAL DATA

N33-Bridge Median:	0
N34-Skew:	15
N35-Structure Flared:	1
N37-Historical Significance:	5
N107-Deck Str Type:	1
N108-Wear Surf Prot System:	1 0 0
A201-Wear Surf Thickness (inches):	0

DIMENSIONS

N32-Appr Rdwy Width (feet):	54
N48-Max Span Length (feet):	75
N49-Structure Length (feet):	1502
N50a-Lt Curb/Swlk Width (feet):	0
N50b-Rt Curb/Swlk Width (feet):	0
N51-Br Width Curb-Curb (feet):	58
N52-Deck Width Out-Out (feet):	61.2
N112-NBIS Br Length?	Y

VERTICAL and HORIZONTAL CLEARANCE

N53-Min Vert Over Clr (feet):		99.99
N54-Min Vert Under Clr (feet):	N	0
N55-Min Lat Under Clr Rt (feet):	N	99.9
N56-Min Lat Under Clr Lt (feet):		0

SERVICE TYPE and SPAN INFORMATION

N42-Service Type:	1 5
N43-Str Type, Main:	6 02
N44-Str Type, Appr:	0 00
N45-Number of Main Spans:	20
N46-Number of Appr Spans:	0

CONDITION RATINGS

N58-Deck:	6
N59-Superstructure:	7
N60-Substructure:	7
N61-Channel:	8
N62-Culvert:	N

APPRAISAL RATINGS

N67-Struct Evaluation:	7
N68-Deck Geometry:	7
N69-Underclearance Rtg:	N
N71-Waterway Adequacy:	8
N72-Appr Rdw Align:	8
N36-Traffic Safety Features:	1 1 1 1

BRIDGE SCOUR DATA

N113-Scour Critical Rtg:	8
A202-Foundation Type:	1 1
A220-Found Embed (feet):	25
A221-Scour Countermeasure:	0 4 2

LOAD RATE and POST

N31-Design Loading:	6
N41-Open, Post, Close:	A
N63-Method Used for Oper. Rtg.:	5
N64-Operating Load Rtg:	2 - 36
N65-Method Used for Inv. Rtg.:	5
N66-Inventory Load Rtg:	2 - 36
N70-Bridge Posting:	5
N103-Temp Str Designation:	
A211-Posted Limit (Tons):	0
A222-Date of Load Rtg:	
A233-Posted Vert Clr NB/EB (ft-in):	0 - 0
A233-Posted Vert Clr SB/WB (ft-in):	

PROPOSED IMPROVEMENTS

N75-Type of Work:	31 1
N76-Length of Str Imp (feet):	1574
N94-Br Improv Cost (x1000):	$4,817
N95-Rdwy Improv Cost (x1000):	$345
N96-Total Project Cost (x1000):	$6,921
N97-Year of Cost Estimate:	1996

CONSTRUCTION PROJECT DATA

N27-Year Built:	1978
N106-Year of Reconstruction:	0000
A204-Orig Project Number:	I-10-2(44)
A205-Orig Project Station:	6857+33.72
A223-TRACS Number:	
A225-Deck Area (sq. feet):	91922
A226-Superstr Unit Cost:	$11
A227-Substr Unit Cost:	$4

INSPECTION

N90-Inspection Date:	5/23/2005
N91-Insp Freq (months):	24
A207-Inspection Quarter:	5
A208-Inspection Number:	13
A228-Next Insp Date:	Quarter 1, 2007

CRITICAL FEATURES

N92A-Fracture Critical:	N 0
N92B-Underwater Insp:	N 0
N92C-Special Insp:	N 0
N93A-Date Fract Crit Insp:	0
N93B-Date Underwtr Insp:	0
N93C-Date Spec Insp:	0
A234-Steel In-Depth Insp Freq (mo):	0

CULVERT INFORMATION

A217-Culv Barrel Height (feet)	0
A218-Culv Length (feet):	0
A219-Culv Fill Height (feet):	0

BRIDGE RAILING

A206a-Bridge Rail Type:	9
A206b-Geometric Conform:	1
A206c-Structural Conform:	1

SUFFICIENCY RATING

Sufficiency Rating:	95.31

GENERAL COMMENTS

ARIZONA DEPARTMENT OF TRANSPORTATION

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1852	Structure Name:	Agua Fria Riv Br EB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; EB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

P.E. Seal

N58 - Deck Overall Rating: **6** - Satisfactory

Top Deck / Wearing Surface	6	- Satisfactory	concrete
Deck Undersurface	7	- Good	cocncrete
Sidewalk / Median / Curb	N	- Not Applicable	
N36a - Bridge Railings	1	- Meets Standards	New Jersey barrier; Metal guard rail supported on timber posts
N36b - Rail Transitions	1	- Meets Standards	
Deck Joint	6	- Satisfactory	strip seal away from abutments; at abutments no seal.
Drainage System	8	- Very Good	6" Dia deck drains in overhangs

Overall Deck Inspection Notes:

1. The deck has hairline to medium sized transverse cracks throughout. Also, deck has longitudinal and transverse cracks at the east transition.
2. The paving notch joints at Abutments #1 and #2 are unsealed and have edge spalls along the deck side of the joint (see photo 0185213E.jpg).
3. Concrete spalling in South deck overhang at joint of Pier #4.
4. The thin deck patch in the on-ramp lane near pier #1 has partially delaminated and spalled (see photo 0185213J.jpg and repair report).
5. Spalling in soffit @ N. joint of pier #12 mentioned in the previous report was not verified.
6. East joint is showing signs of deterioration (see photo 0185213E.jpg).
7. Debris in all joints.
8. Joint openings at 90F: (at the south side) pier #4: 1 3/8", pier #8: 2", pier #12: 1 7/8" and pier #16: 1 7/8".

N59 - Superstructure Overall Rating: **7** - Good

Main Members	7	- Good	PS mutli-beam I girders
Secondary Members	8	- Very Good	concrete diaphragms
Bearing Devices	7	- Good	elastomeric bearing pads
Paint System	N	- Not Applicable	
Utilities	N	- Not Applicable	

Overall Superstructure Inspection Notes:

1. Spans 9 to 20 were not checked due to the ponding water in the river.
2. There are transverse cracks with efflorescence in soffit.
3. There is spall in W abutment diaphragms in 2nd and 5th bay from south (see photos 0185213H.jpg).

N60 - Substructure Overall Rating: **7** - Good

Abutment	7	- Good	stub abutments
Piers	7	- Good	concrete circular cloumns
Slope Protection	7	- Good	soil cement walls
Wingwalls, Dados, etc.	8	- Very Good	concrete

Overall Substructure Inspection Notes:

1. Spans 9 to 20 were not checked due to the ponding water in the river.
2. There are vertical hairline cracks in W abutment.
3. Minor cracks in wingwalls.
4. There is 1' local scour at North column of Pier #5.

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1852	Structure Name:	Agua Fria Riv Br EB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; EB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

5. There is 2.5' local scour between Columns 2 and 3 of Pier #7 (see photo 0185213I.jpg).
6. There is graffiti on abutments and most columns.

N61 - Waterway Overall Rating: **8** - Very Good

Channel	8	- Very Good	native sandy soil away from abutments and rock rip-rap near abutments
Bank Protection	8	- Very Good	soil cement walls

Overall Waterway Inspection Notes:

1. The soil-cement wall is in good condition.
2. Some vegetation in the channel.
3. Elevations beyond span #8 were not verified due to the ponding water in the river.

Roadway / Safety

Approaches	8	- Very Good	PCC approach slabs
Fills	7	- Good	native soil
N36c - Approach Rail	1	- Meets Standards	metal guard rail on timber posts; breakaway ends
N36d - Rail Ends	1	- Meets Standards	
Signing	8	- Very Good	Reduce Speed Sign
Lighting	N	- Not Applicable	
A211-Posted Weight	0	**tons**	

Overall Roadway / Safety Inspection Notes:

1- Approaches have longitudinal hairline cracks at the transition.

Appraisal Items

N67 - Structural Evaluation	7	- Better than Present Minimum Criteria
N68 - Deck Geometry	7	- Better than Present Minimum Criteria
N69 - Vert. and Horiz. Clearances	N	- Not Applicable
N71 - Waterway Adequacy	8	- Equal to Present Desirable Criteria
N72 - Approach Roadway Alignment	8	- Equal to Present Desirable Criteria
N113 - Scour Critical	8	- Calculated Scour Is above Top of Footing

Overall Appraisal Items Notes:

Other Miscellaneous Inspection Notes:

A. This is a routine inspection completed by Premier Engineering Corporation under task order #5.
B. This inspection was performed without using any traffic control or any lane closure.
C. One of the two repair recommended in the previous report was not performed. One repair, repeated from previous inspection, is recommended at this time.

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1852	Structure Name:	Agua Fria Riv Br EB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; EB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

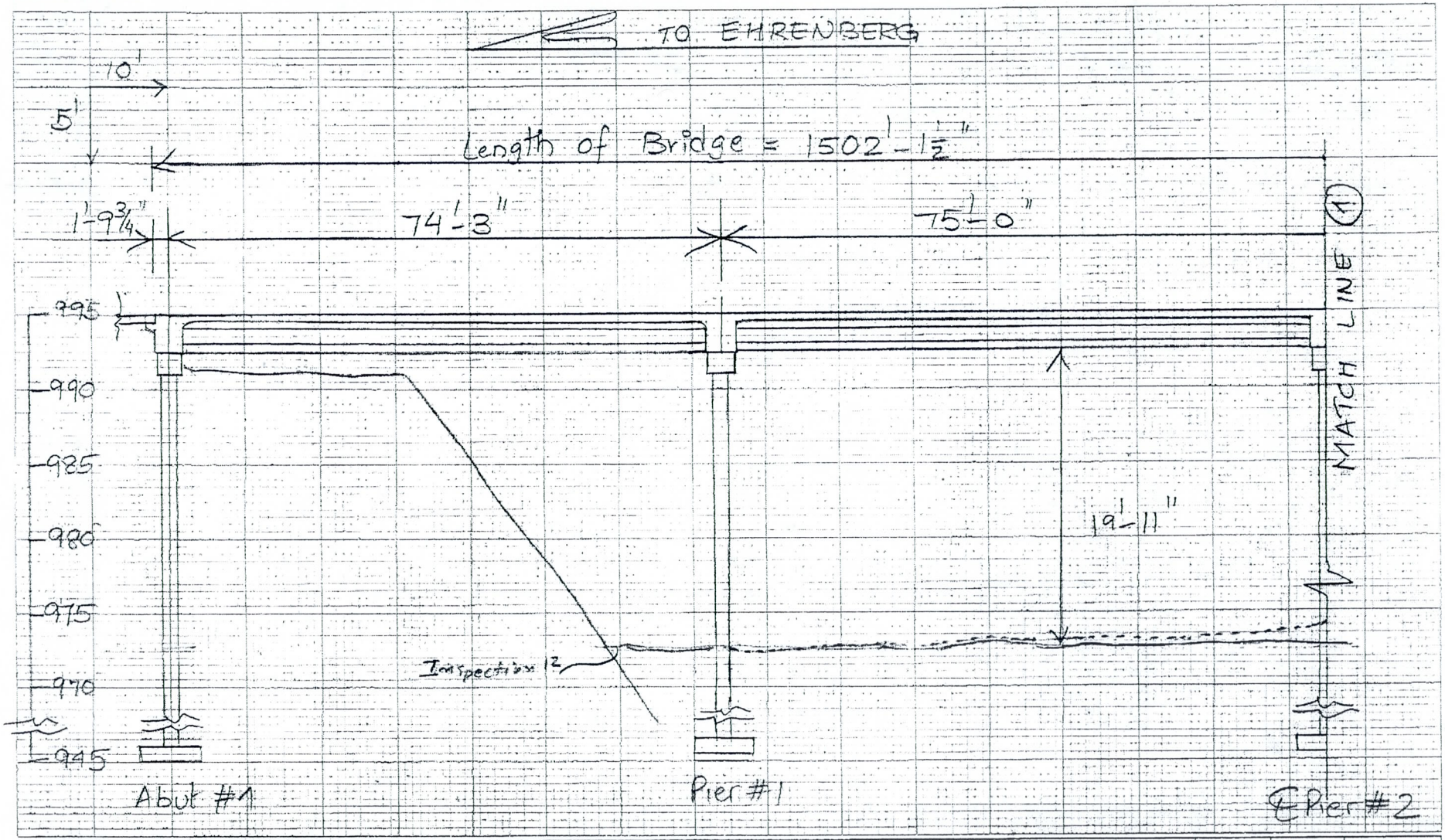
D. Photos taken:
1. 0185213A.jpg. Roadway ID, Looking West.
2. 0185213B.jpg. Elevation ID, Looking Northwest.
3. 0185213C.jpg. Typical Deck.
4. 0185213C1.jpg. Typical Deck in span #2.
5. 0185213D.jpg. Typical Soffit.
6. 0185213E.jpg. East joint.
7. 0185213F.jpg. Pier #16 (from W to E) joint.
8. 0185213G.jpg. Channel looking South.
9. 0185213H.jpg. Concrete spalling in West abutment diaphragm, 5th bay from South.
10. 0185213I.jpg. Local scour (2.5' deep) between columns 2 and 3 of Pier #7.
11. 0185213J.jpg. Deck delamination at Pier #1 in on-ramp lane.

Bridge Element Condition Rating

Elem #	Description	Env	Unit	Total Qty	Cond 1	Cond 2	Cond 3	Cond 4	Cond 5
12	Bare Concrete Deck	2	EA	1	0	1	0	0	0
109	P/S Conc Open Girder/Beam	2	LF	13746	13746	0	0	0	0
205	R/Conc Column	2	EA	76	76	0	0	0	0
215	R/Conc Abutment	2	LF	125	125	0	0	0	0
234	R/Conc Cap	2	LF	1207	1207	0	0	0	0
302	Compression Joint Seal	2	LF	256	256	0	0	0	0
310	Elastomeric Bearing	2	EA	194	0	194	0	0	0
321	Reinforced Concrete Approach Slab w/ or w-o/AC Ov	2	EA	2	2	0	0	0	0
331	Reinforced Concrete Bridge Railing	2	LF	3004	3004	0	0	0	0
358	Deck Cracking SmFlag	2	EA	1	0	1	0	0	0

Name of Structure: Agua Fria River Bridge (EB) **Channel Profile Diagram**
Structure No. 1852
Location: Route I10 MP 130.00

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report

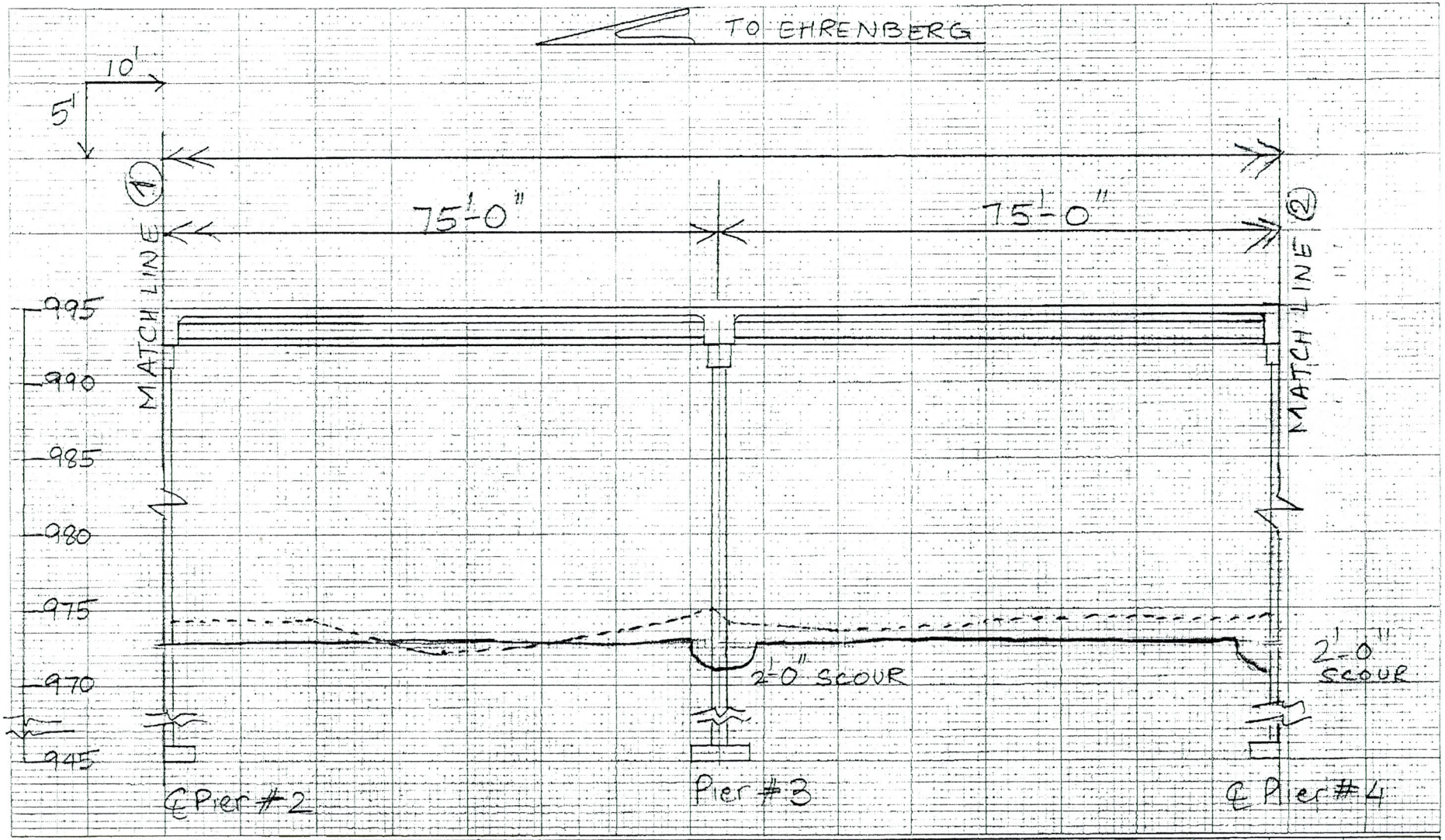


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P '	Depth at the right side of Support 'P '	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P2	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	2'-0"	2'-0"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"					
13	5-23-05	GK, TD	U/S	2.0'	2.0'	20.0'	20.0'	20.0'	20.0'	19.85'	19.8'	19.17'	18.2'					

Name of Structure: Agua Fria River Bridge (EB)
Structure No. 1852
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 3'	Depth at the right side of Support 'P 3'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 4'	Depth at the Right side of Support 'P '	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-02	GK	U/S	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	21'-11"	21'-11"	19'-11"	19'-11"	21'-11"					
13	5-21-03	GK, TD	D/S	18.21'	18.21'	20.52'	19.18'	17.66'	17.40'	18.0'	18.33'	18.11'	17.71'					

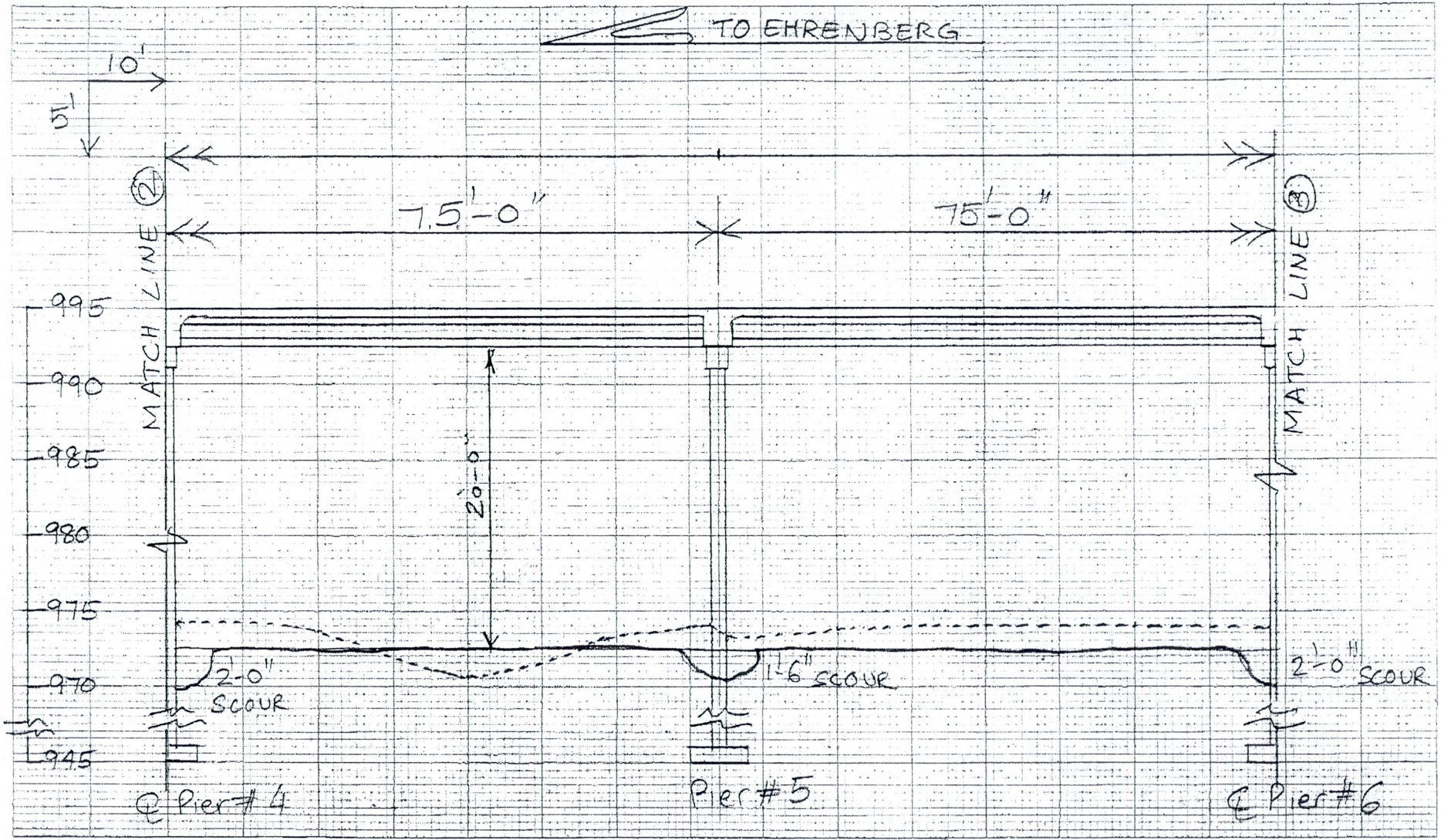
Name of Structure: Agua Fria River Bridge (EB) 1852

Structure No.

Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P5'	Depth at the right side of Support 'P5'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 6'	Depth at the Right side of Support 'P'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	21'-11"	20'-0"	20'-5"	20'-0"	21'-6"	21'-6"	20'-0"	20'-0"	20'-0"	22'-0"					
13	5-23-05	GK/TD	D/S	18.0'	18.29'	22.0'	18.14'	18.19'	18.81'	18.47'	18.17'	18.0'	18.0'					

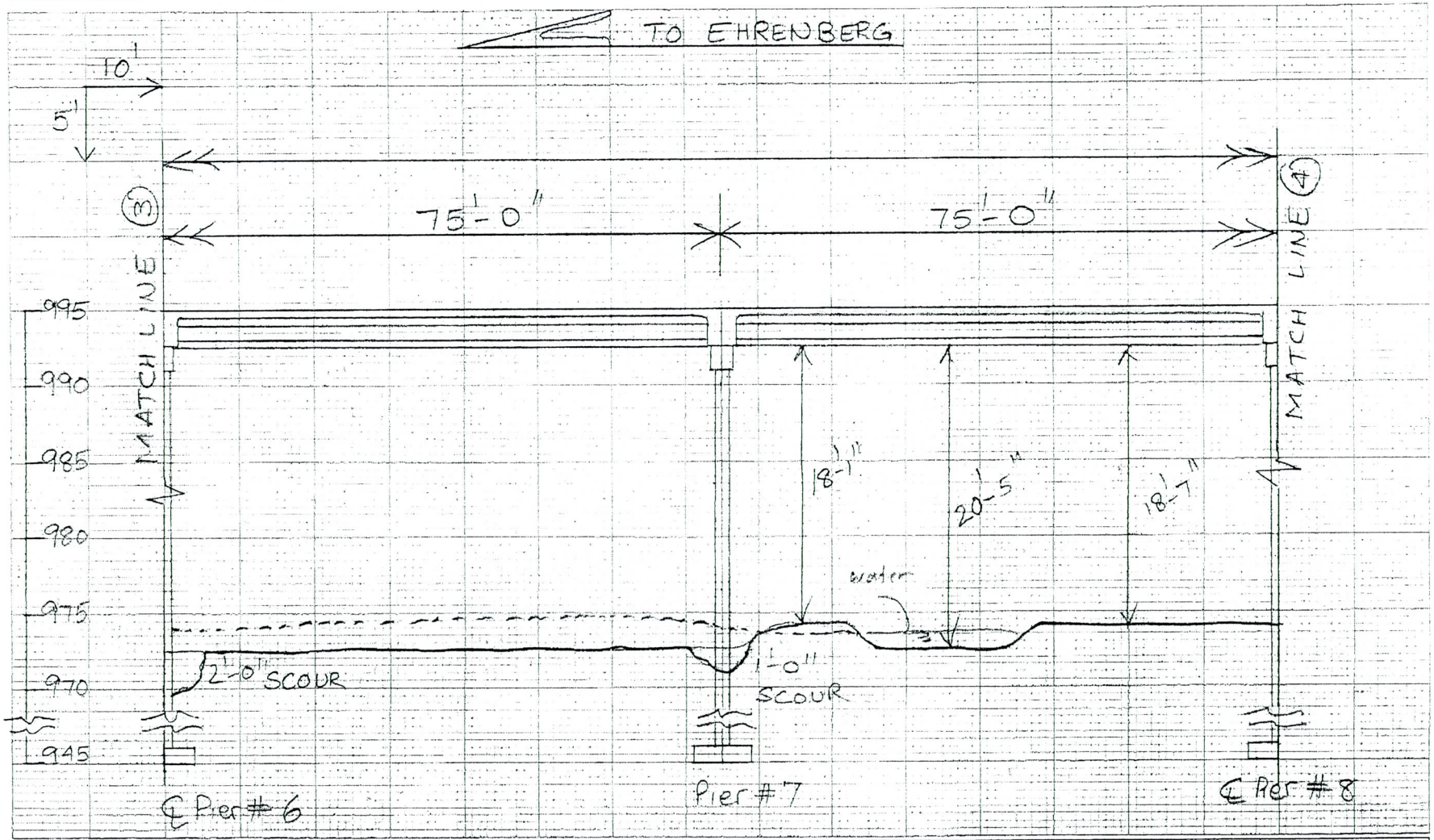
Name of Structure: Agua Fria River Bridge (EB) 1852

Structure No.

Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 7	Depth at the right side of Support 'P 7	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 8	Depth at the Right side of Support 'P 8	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	22'-0"	20'-0"	20'-0"	20'-0"	21'-0"	21'-0"	18'-1"	20'-5"	18'-7"	18'-7"					
13	5-23-05	GK TO	D/S	18.0'	17.57'	17.44'	17.32'	17.55'	18.18'	18.68'	Water Ponding							

† 6/ R04/03

Note: Channel depths will be measured from the bottom of the girder or the
Local scour, if observed at locations other than above, will be noted on this

· For short span (<40'), depths at quarter & three-quarter lengths may not be necessar
with inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

Name of Structure: Agua Fria River Bridge (EB)

Structure No. 1852

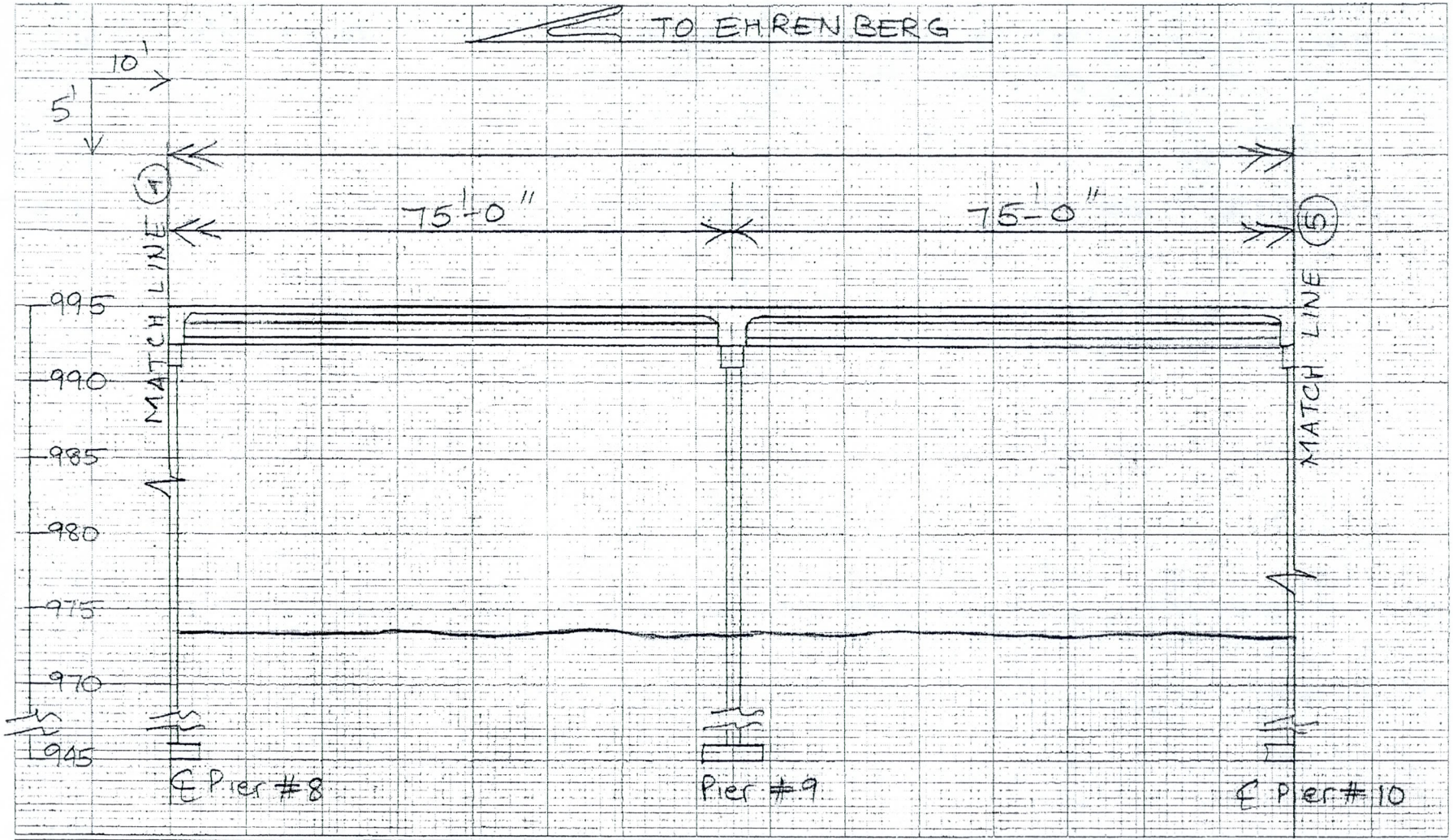
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation

Bridge Group

Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS) 8	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 9	Depth at the right side of Support 'P 9	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 10	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	G.K.	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	G.K./T.D.	D/S	Not	Checked	due to	Water	Ponding										

† 64-4505 R04/03

Note: Channel depths will be measured from the bottom of the girder or the slab; For short span (<40'), depths at quarter & three-quarter lengths may not be necessary; Local scour, if observed at locations other than above, will be noted on this sheet with inspection date; RHS--> Right Hand Side; LHS--> Left Hand Side.

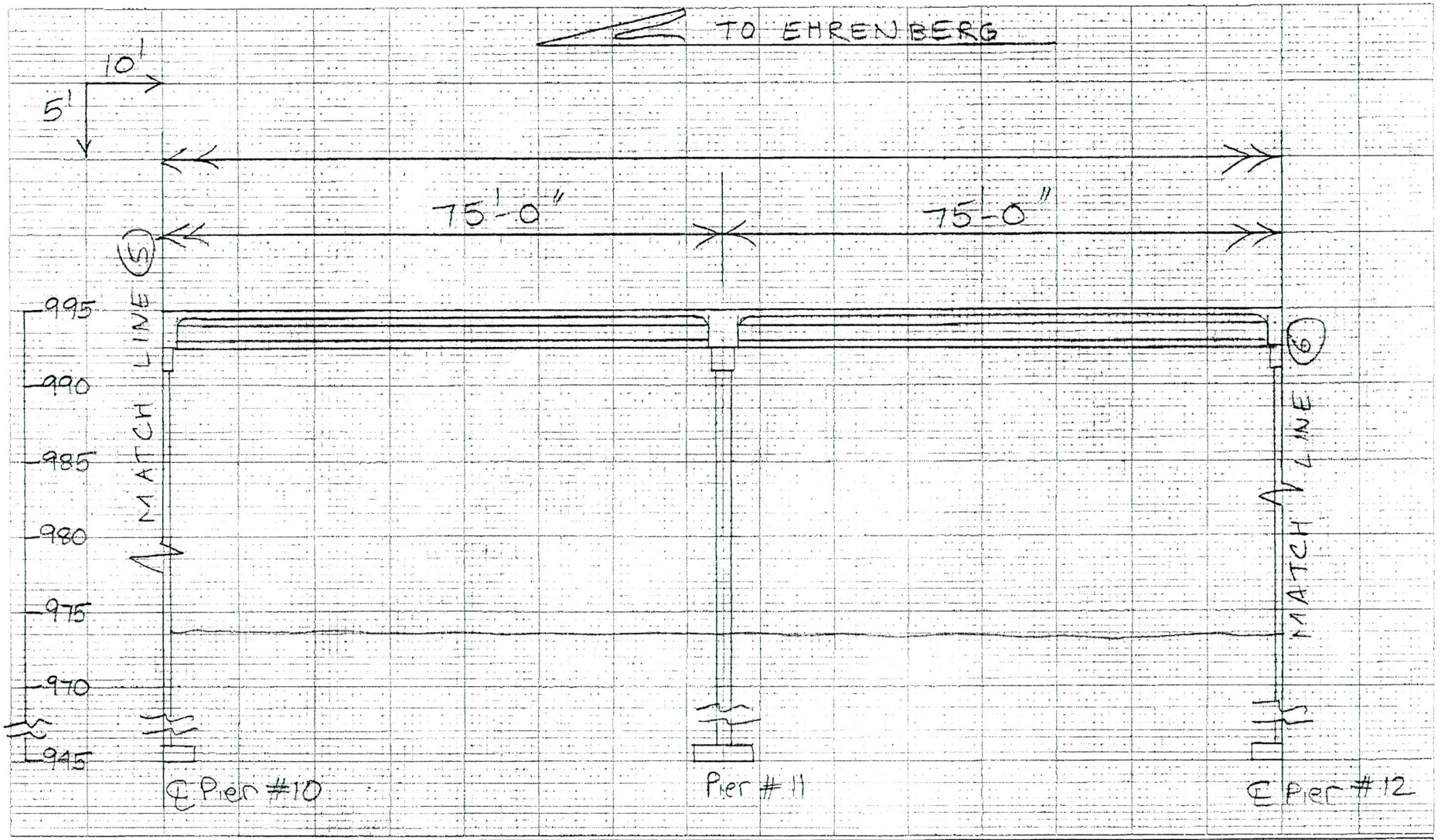
Name of Structure: Agua Fria River Bridge (EB) 1852

Structure No.

Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P'(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 11'	Depth at the right side of Support 'P 11'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 12'	Depth at the Right side of Support 'P'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P'(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-17-05	GK, TD	D/S	Not Checked due to Water Ponding														

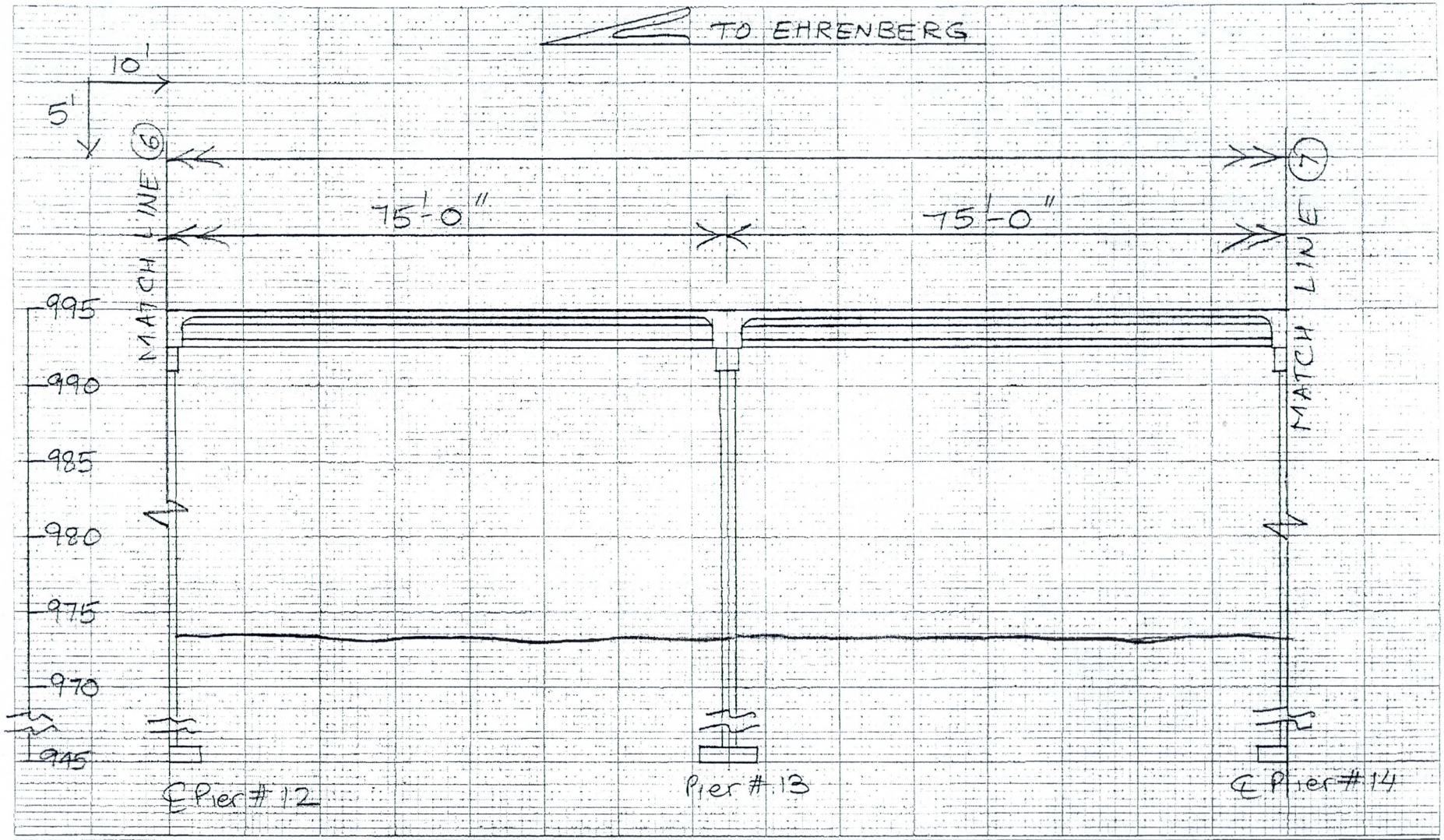
Sheet 7 of 10

Name of Structure: Agua Fria River Bridge (EB) **Channel Profile Diagram**

Structure No. 1852

Location: Route I-10 MP 130.00

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report

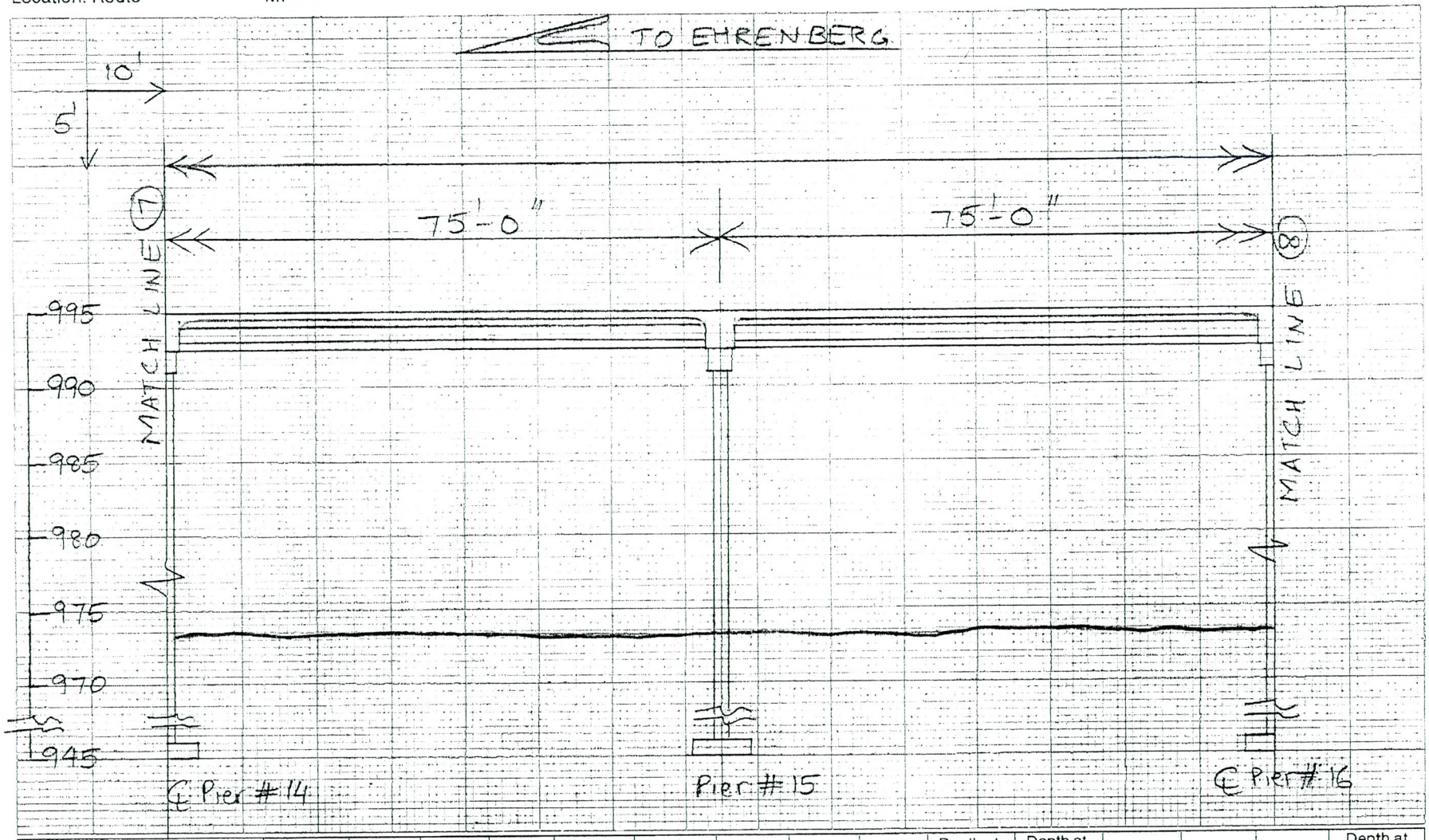


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)/2	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P13	Depth at the right side of Support 'P12	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P14	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	5-12-05	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK/TD	D/S	Not checked due to water ponding														

Name of Structure: Agua Fria River Bridge (EB)
Structure No. 1852
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



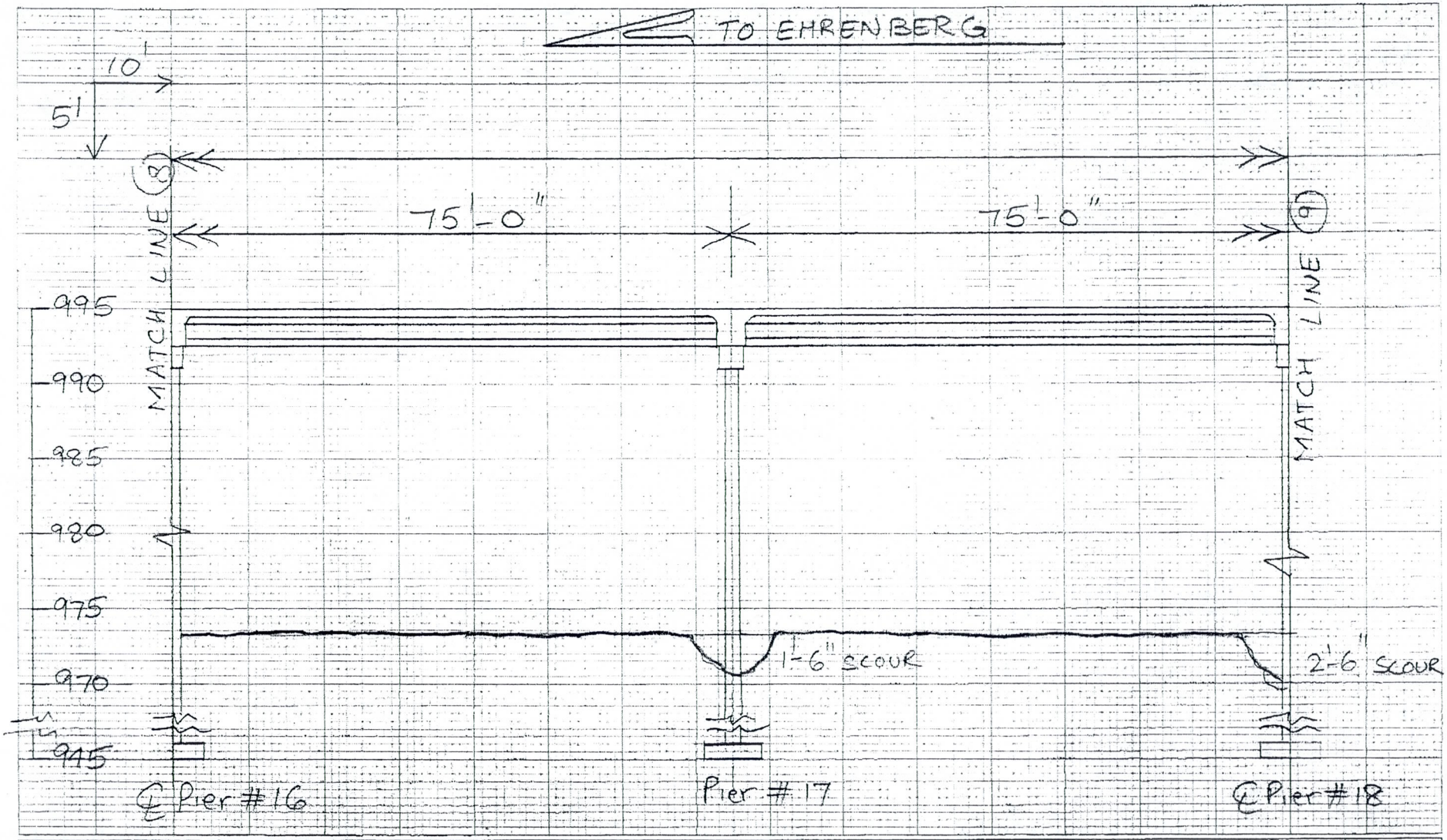
Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P15	Depth at the right side of Support 'P15	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P16	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK/TD	D/S	Not checked due to water ponding														

† 64-45 03 Note: Channel depths will be measured from the bottom of the girder or the sl ... short span (<40'), depths at quarter & three-quarter lengths may not be necessary; Local scour, if observed at locations other than above, will be noted on this sh... n inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

Name of Structure: Agua Fria River Bridge
Structure No. 1852
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report

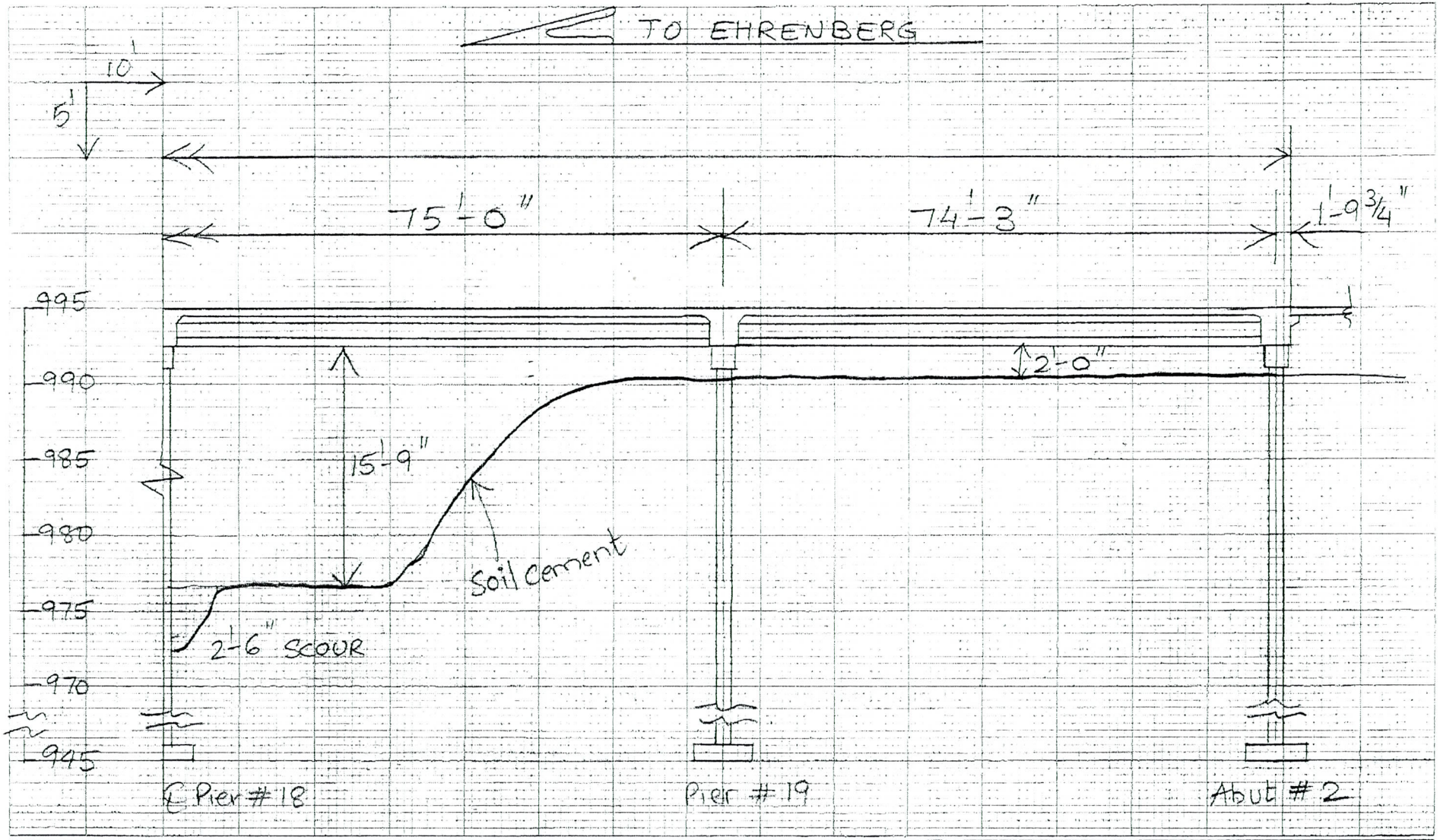


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 17	Depth at the right side of Support 'P 17	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 18	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	20'-1"	20'-1"	18'-7"	18'-7"	18'-7"	21'-1"					
13	8-23-05	GK/TD	U/S	Not Checked due to Water Ponding														

Name of Structure: Agua Fria River Bridge (EB)
Structure No. 1852
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P18'	Depth at the right side of Support 'P19'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P Abut 2'	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-05	GK	U/S	2'-1"	17'-2"	15'-9"	7'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"					
13	5-23-05	GK, TD	D/S	Not checked	15.75'	7.0'	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'					

Bridge Inspection Report Information
Agua Fria River Bridge Westbound I-10
Structure No. 1853

Source: ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION

BRIDGE GROUP

Structure Inventory & Appraisal

Structure Number: 1853 Structure Name: Agua Fria Riv Br WB
Route: 10 MP 130 Road Name: I 10; WB Agency: ADOT
Feature Under: Agua Fria River
Location: 19.2 mi W Jct I 17

LOCATION INFORMATION

N1-State Code:	049
N2-State Hwy District:	78
N3-County Code:	013
N4-Place Code:	00013
N16-Latitude:	33 deg 27.4 min
N17-Longitude:	112 deg 20.2 min
N98-Border St Code - % Resp:	- 0
N99-Border Bridge Number:	

INVENTORY ROUTE DATA

N19-Detour Length (miles):	1
N20-Toll:	3
N28-Lanes On / Under:	3 / 0
	2nd Record
N5-Inv Rte:	1 1 1 00010 4 -
N10-Inv Rte Min Vert Clr (feet):	99.99
N11-Inv Rte Milepoint:	130
N26-Functional Class:	11
N29-Avg Daily Traffic:	35880
N30-Year of ADT:	2002
N47-Inv Rte Tot Horiz Clr (feet)	58
N100-Defense Hwy:	1
N101-Parallel Bridge:	L
N102-Direction of Traffic:	1
N104-Hwy System:	1
N109-Percent Truck Traffic:	44
N110-National Truck Network:	1
N114-Future ADT:	35890
N115-Year of Future ADT:	2020
A200-Is N5 the Princ. Rte?	Y

RESPONSIBILITY

N21-Maint Responsibility:	01
N22-Bridge Owner:	01
A203-ADOT Org Number:	7871
A224-Insp Team Number:	1
A229-Agency:	ADOT

NAVIGATION

N38-Navigation Control:	0
N39-Nav Vert Clr (feet):	0
N40-Nav Horiz Clr (feet):	0
N111-Nav Pier/Abut Prot:	
N116-Nav Min Vert Clr (feet):	0

GENERAL DATA

N33-Bridge Median:	0
N34-Skew:	15
N35-Structure Flared:	1
N37-Historical Significance:	5
N107-Deck Str Type:	1
N108-Wear Surf Prot System:	1 0 0
A201-Wear Surf Thickness (inches):	0

DIMENSIONS

N32-Appr Rdwy Width (feet):	54
N48-Max Span Length (feet):	75
N49-Structure Length (feet):	1502
N50a-Lt Curb/Swlk Width (feet):	0.8
N50b-Rt Curb/Swlk Width (feet):	0.8
N51-Br Width Curb-Curb (feet):	58
N52-Deck Width Out-Out (feet):	61.2
N112-NBIS Br Length?	Y

VERTICAL and HORIZONTAL CLEARANCE

N53-Min Vert Over Clr (feet):		99.99
N54-Min Vert Under Clr (feet):	N	0
N55-Min Lat Under Clr Rt (feet):	N	99.9
N56-Min Lat Under Clr Lt (feet):		0

SERVICE TYPE and SPAN INFORMATION

N42-Service Type:	1 5
N43-Str Type, Main:	6 02
N44-Str Type, Appr:	0 00
N45-Number of Main Spans:	20
N46-Number of Appr Spans:	0

CONDITION RATINGS

N58-Deck:	6
N59-Superstructure:	7
N60-Substructure:	7
N61-Channel:	8
N62-Culvert:	N

APPRAISAL RATINGS

N67-Struct Evaluation:	7
N68-Deck Geometry:	7
N69-Underclearance Rtg:	N
N71-Waterway Adequacy:	8
N72-Appr Rdw Align:	8
N36-Traffic Safety Features:	1 1 1 1

FRACTURE and SCOUR DATA

N113-Scour Critical Rtg:	8
A202-Foundation Type:	1 1
A220-Found Embed (feet):	25
A221-Scour Countermeasure:	0 4 2

LOAD RATE and POST

N31-Design Loading:	6
N41-Open, Post, Close:	A
N63-Method Used for Oper. Rtg.:	5
N64-Operating Load Rtg:	2 - 36
N65-Method Used for Inv. Rtg.:	5
N66-Inventory Load Rtg:	2 - 36
N70-Bridge Posting:	5
N103-Temp Str Designation:	
A211-Posted Limit (Tons):	0
A222-Date of Load Rtg:	
A233-Posted Vert Clr NB/EB (ft-in):	0 - 0
A233-Posted Vert Clr SB/WB (ft-in):	0 - 0

PROPOSED IMPROVEMENTS

N75-Type of Work:	31 1
N76-Length of Str Imp (feet):	1574
N94-Br Improv Cost (x1000):	$4,817
N95-Rdwy Improv Cost (x1000):	$345
N96-Total Project Cost (x1000):	$6,920
N97-Year of Cost Estimate:	1996

CONSTRUCTION PROJECT DATA

N27-Year Built:	1978
N106-Year of Reconstruction:	0000
A204-Orig Project Number:	I-10-2(44)
A205-Orig Project Station:	6857+62.66
A223-TRACS Number:	
A225-Deck Area (sq. feet):	91922
A226-Superstr Unit Cost:	$11
A227-Substr Unit Cost:	$4

INSPECTION

N90-Inspection Date:	5/23/2005
N91-Insp Freq (months):	24
A207-Inspection Quarter:	5
A208-Inspection Number:	13
A228-Next Insp Date:	Quarter 1, 2007

CRITICAL FEATURES

N92A-Fracture Critical:	N 0
N92B-Underwater Insp:	N 0
N92C-Special Insp:	N 0
N93A-Date Fract Crit Insp:	0
N93B-Date Underwtr Insp:	0
N93C-Date Spec Insp:	0
A234-Steel In-Depth Insp Freq (mo):	0

CULVERT INFORMATION

A217-Culv Barrel Height (feet)	0
A218-Culv Length (feet):	0
A219-Culv Fill Height (feet):	0

BRIDGE RAILING

A206a-Bridge Rail Type:	9
A206b-Geometric Conform:	1
A206c-Structural Conform:	1

SUFFICIENCY RATING

Sufficiency Rating:	95.31

GENERAL COMMENTS

ARIZONA DEPARTMENT OF TRANSPORTATION

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1853	Structure Name:	Agua Fria Riv Br WB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; WB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

P.E. Seal

N58 - Deck Overall Rating: 6 - Satisfactory

Top Deck / Wearing Surface	6	- Satisfactory	concrete
Deck Undersurface	7	- Good	concrete
Sidewalk / Median / Curb	N	- Not Applicable	
N36a - Bridge Railings	1	- Meets Standards	New Jersey concrete barrier
N36b - Rail Transitions	1	- Meets Standards	
Deck Joint	6	- Satisfactory	strip seals
Drainage System	8	- Very Good	6" Dia deck drains in overhangs

Overall Deck Inspection Notes:

1. The deck has hairline to medium sized transverse cracks at 3' to 12' oc. There are areas of pattern cracks over the piers.
2. There are transverse cracks with efflorescence in soffit.
3. There are minor vertical cracks in barriers.
4. The thin deck patch in the off ramp lane has partially delaminated and has several small spalls (see photo 0185313J.jpg).
5. Joint filler at east abutment is deteriorating.
6. North deck overhang at joint of Pier 4 has spall with exposed rebar (see photo 0185313I.jpg).
7. Debris in all joints.
8. Joint openings at 90 F: (at the North side) pier #4: 1 1/4", pier #8: 1 1/2", pier #12: 1 5/8" and pier #16: 1 1/4".

N59 - Superstructure Overall Rating: 7 - Good

Main Members	7	- Good	PS multi-beam I girders
Secondary Members	8	- Very Good	concrete diaphragms
Bearing Devices	8	- Very Good	elastomeric bearing pads
Paint System	N	- Not Applicable	
Utilities	N	- Not Applicable	None seen

Overall Superstructure Inspection Notes:

1. Spans 9 to 20 were not checked due to the ponding water in the river.

N60 - Substructure Overall Rating: 7 - Good

Abutment	7	- Good	stub abutments
Piers	8	- Very Good	4 circular columns / bent
Slope Protection	7	- Good	soil-cement walls
Wingwalls, Dados, etc.	8	- Very Good	concrete

Overall Substructure Inspection Notes:

1. Spans 9 to 20 were not checked due to the ponding water in the river.
2. The 2.5' local scour at pier #11, 3rd column from north, was not verified during this inspection..
3. Minor random cracks in wingwalls.

N61 - Waterway Overall Rating: 8 - Very Good

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1853	Structure Name:	Agua Fria Riv Br WB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; WB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

Channel	8	- Very Good	native sandy soil away from abutments and rock rip-rap near abutments
Bank Protection	8	- Very Good	soil-cement wall

Overall Waterway Inspection Notes:

1. The soil-cement wall is in good condition.
2. Some vegetation in the channel.
3.Elevations beyond span #8 were not verified due to the ponding water in the river.

Roadway / Safety

Approaches	8	- Very Good	PCC approach slabs
Fills	8	- Very Good	Embankment
N36c - Approach Rail	1	- Meets Standards	Metal beam guard rail on wooden posts; breakaway ends.
N36d - Rail Ends	1	- Meets Standards	
Signing	N	- Not Applicable	
Lighting	N	- Not Applicable	
A211-Posted Weight	0	tons	

Overall Roadway / Safety Inspection Notes:

1. Medium sized transverse and longitudinal cracks in approach slabs.

Appraisal Items

N67 - Structural Evaluation	7	- Better than Present Minimum Criteria
N68 - Deck Geometry	7	- Better than Present Minimum Criteria
N69 - Vert. and Horiz. Clearances	N	- Not Applicable
N71 - Waterway Adequacy	8	- Equal to Present Desirable Criteria
N72 - Approach Roadway Alignment	8	- Equal to Present Desirable Criteria
N113 - Scour Critical	8	- Calculated Scour Is above Top of Footing

Overall Appraisal Items Notes:

Other Miscellaneous Inspection Notes:

A. This is a routine inspection completed by Premier Engineering Corporation under task order #5.
B. This inspection was performed without using any traffic control or any lane closure.
C. Repair recommended in the previous report was not performed. One repair is, repeated from previous inspection, recommeded at this time.
D. Photos taken:
1. 0185313A.jpg. Roadway ID, Looking East.
2. 0185313B.jpg. Elevation ID, Looking East.
3. 0185313C.jpg. Typical Deck.
4. 0185313D.jpg. Typical Soffit.
5. 0185313E.jpg. East joint

BRIDGE GROUP

Bridge Inspection Report

Structure Number:	1853	Structure Name:	Agua Fria Riv Br WB	Inspected By:	Premier: GK, TD
Route:	10	Road Name:	I 10; WB	Inspection No:	13
MilePost:	130	Agency:	ADOT	Date of Insp.:	Monday, May 23, 2005
ADOT District:	Phoenix	District Org:	7871	Next Insp. Due By:	Quarter 1, 2007

6. 0185313F.jpg. Pier #16 (from W to E) joint.
7. 0185313G.jpg. Impact damage to southwest approach guardrail.
8. 0185313H.jpg. Concrete spalling in North deck overhang at joint of Pier #4.
9. 0185313I.jpg. Minor concrete spalling at the W abutment in the off-ramp lane.

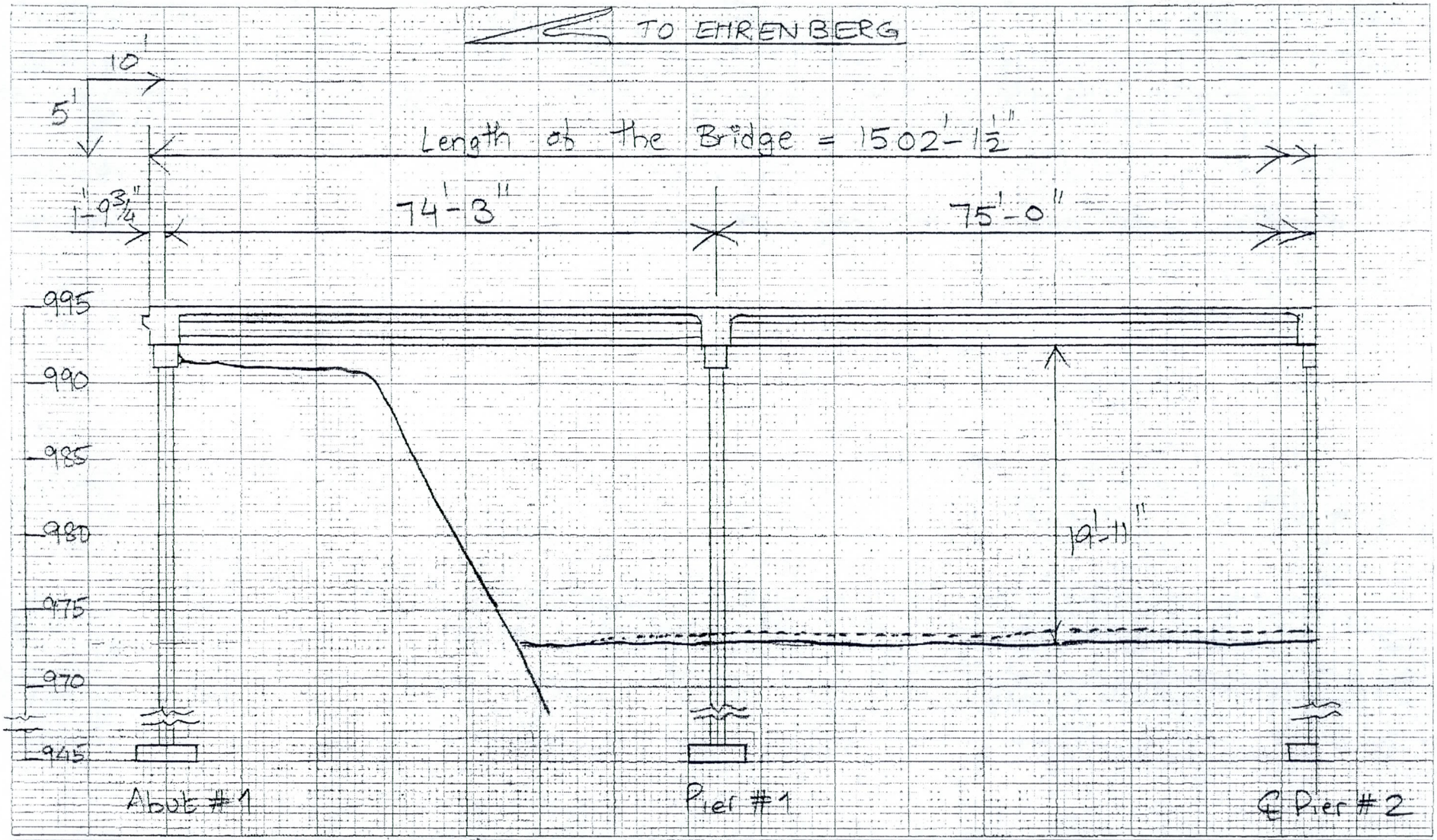
Bridge Element Condition Rating

Elem #	Description	Env	Unit	Total Qty	Cond 1	Cond 2	Cond 3	Cond 4	Cond 5
12	Bare Concrete Deck	2	EA	1	0	1	0	0	0
109	P/S Conc Open Girder/Beam	2	LF	13746	13746	0	0	0	0
205	R/Conc Column	2	EA	76	76	0	0	0	0
215	R/Conc Abutment	2	LF	125	125	0	0	0	0
234	R/Conc Cap	2	LF	1207	1207	0	0	0	0
302	Compressn Joint Seal	2	LF	256	0	190	66	0	0
310	Elastomeric Bearing	2	EA	194	194	0	0	0	0
321	Reinforced Concrete Approach Slab w/ or w-o/AC Ov	2	EA	2	2	0	0	0	0
331	Reinforced Concrete Bridge Railing	2	LF	3004	3004	0	0	0	0
358	Deck Cracking SmFlag	2	EA	1	0	1	0	0	0

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P' (RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P'	Depth at the right side of Support 'P'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P'	Depth at the Right side of Support 'P'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P' (LHS)
12	5-10-03	GLC	U/S	2'-0"	2'-0"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"	19'-11"					
13	5-23-05	GLC, TD	U/S	2.0'	2.0	20.0'	19.75'	19.28'	19.29'	19.67'	18.83'	18.60'	19.0'					

Name of Structure: Agua Fria River Bridge(WB)

Structure No. 1853

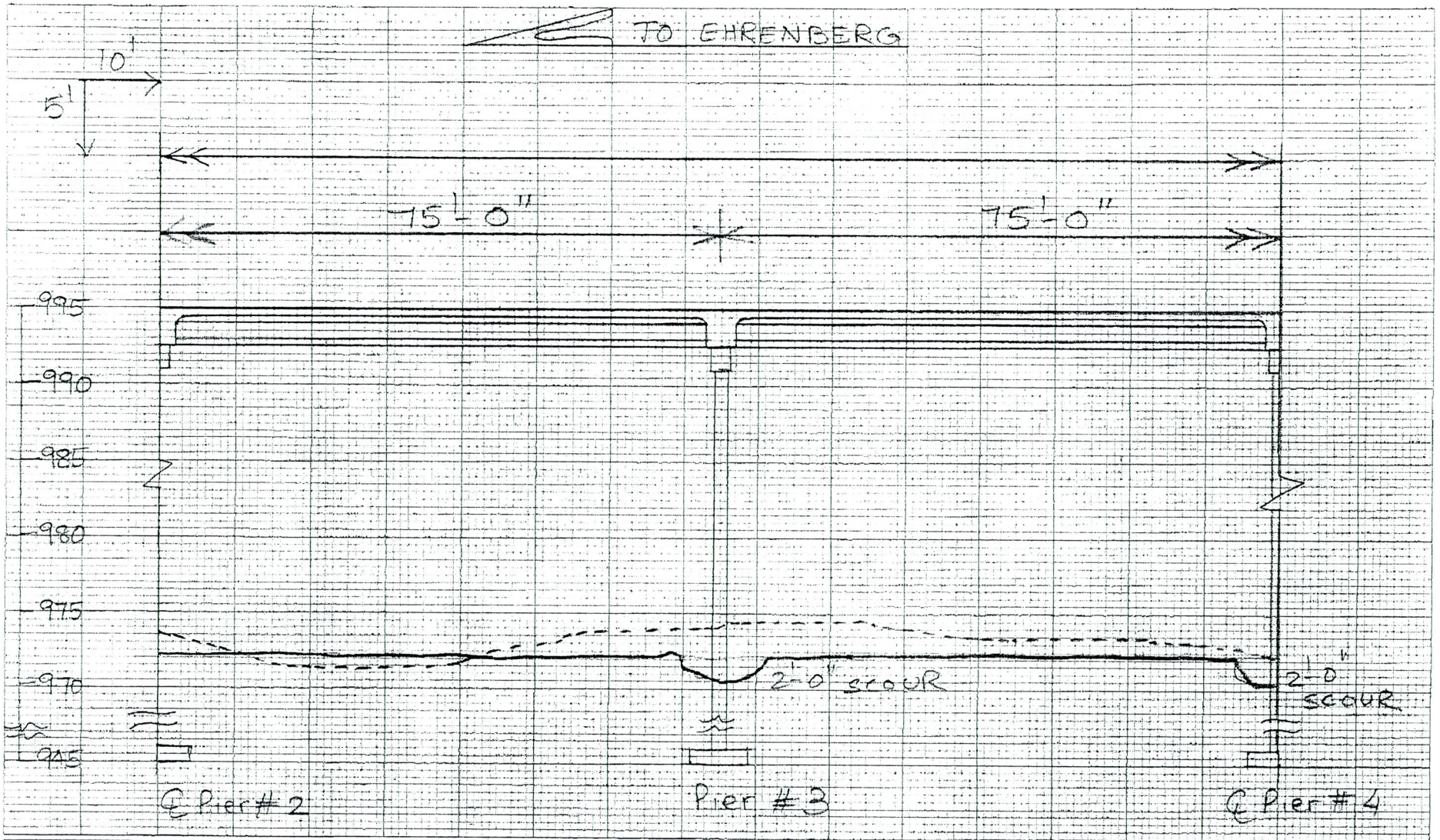
Location: Route I-10 MP 130.050

Channel Profile Diagram

Arizona Department of Transportation

Bridge Group

Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P3	Depth at the right side of Support 'P 3	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 4	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	19'-11"	19'-11"	19'-11"	19'-11"	21'-0"	21'-0"	19'-11"	19'-11"	19'-11"	21'-0"					
13	5-23-05	GK/TD	U/S	18.42'	20.70'	20.13'	18.56'	17.93'	17.49'	17.62'	18.64'	18.59'	19.50'					

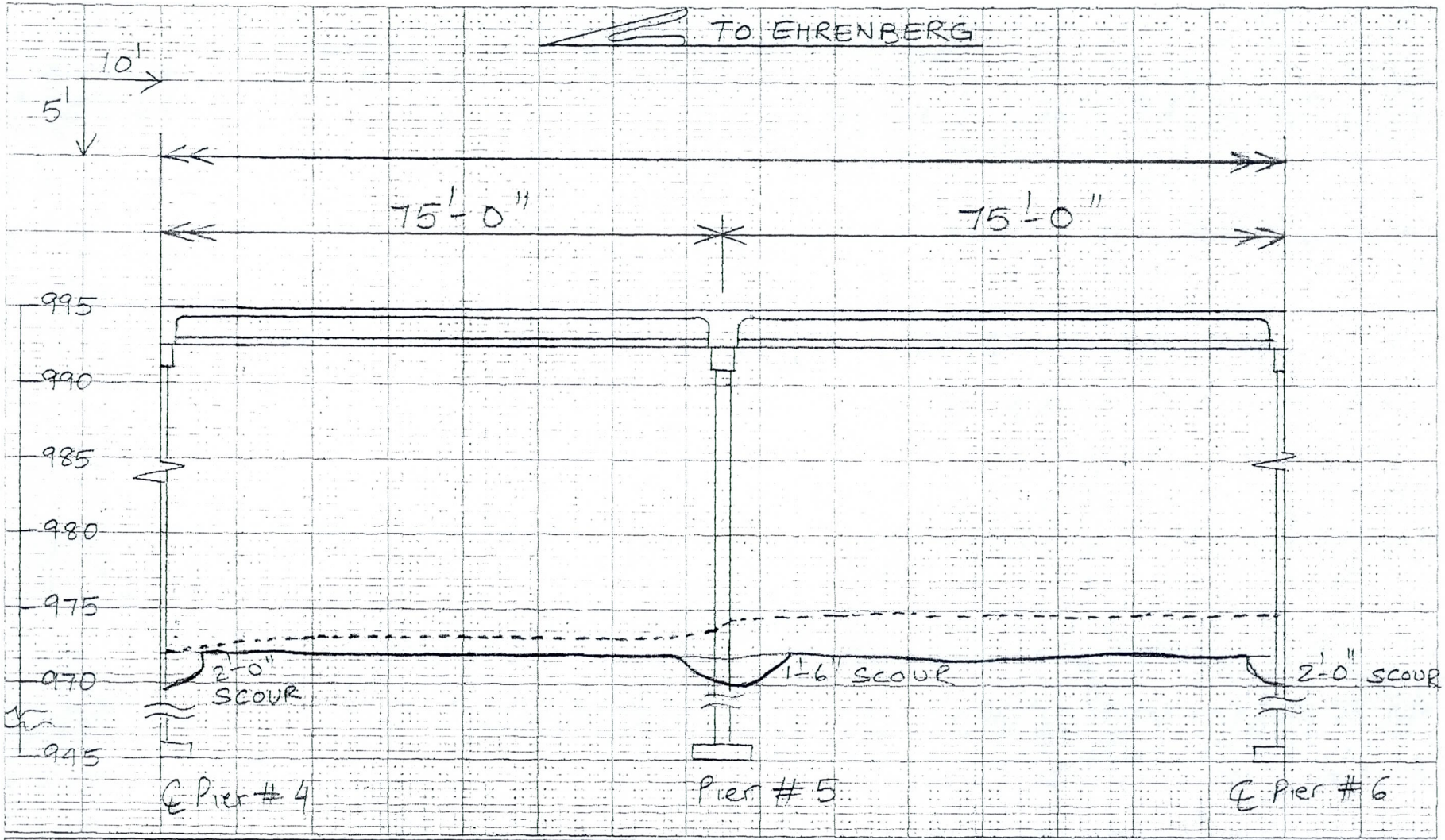
Name of Structure: Agua Fria River Bridge (WB)

Structure No. 1853

Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P5	Depth at the right side of Support 'P5	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P6	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
— 12	6-10-04	EK	U/S	21'-11"	20'-0"	20'-0"	20'-0"	21'-6"	21'-6"	20'-0"	20'-0"	20'-0"	22'-0"					
--- 13	5-23-05	GK, TD	U/S	19.75'	18.97'	18.96'	18.96'	18.29'	17.67'	17.35'	17.35'	17.20'	17.23'					

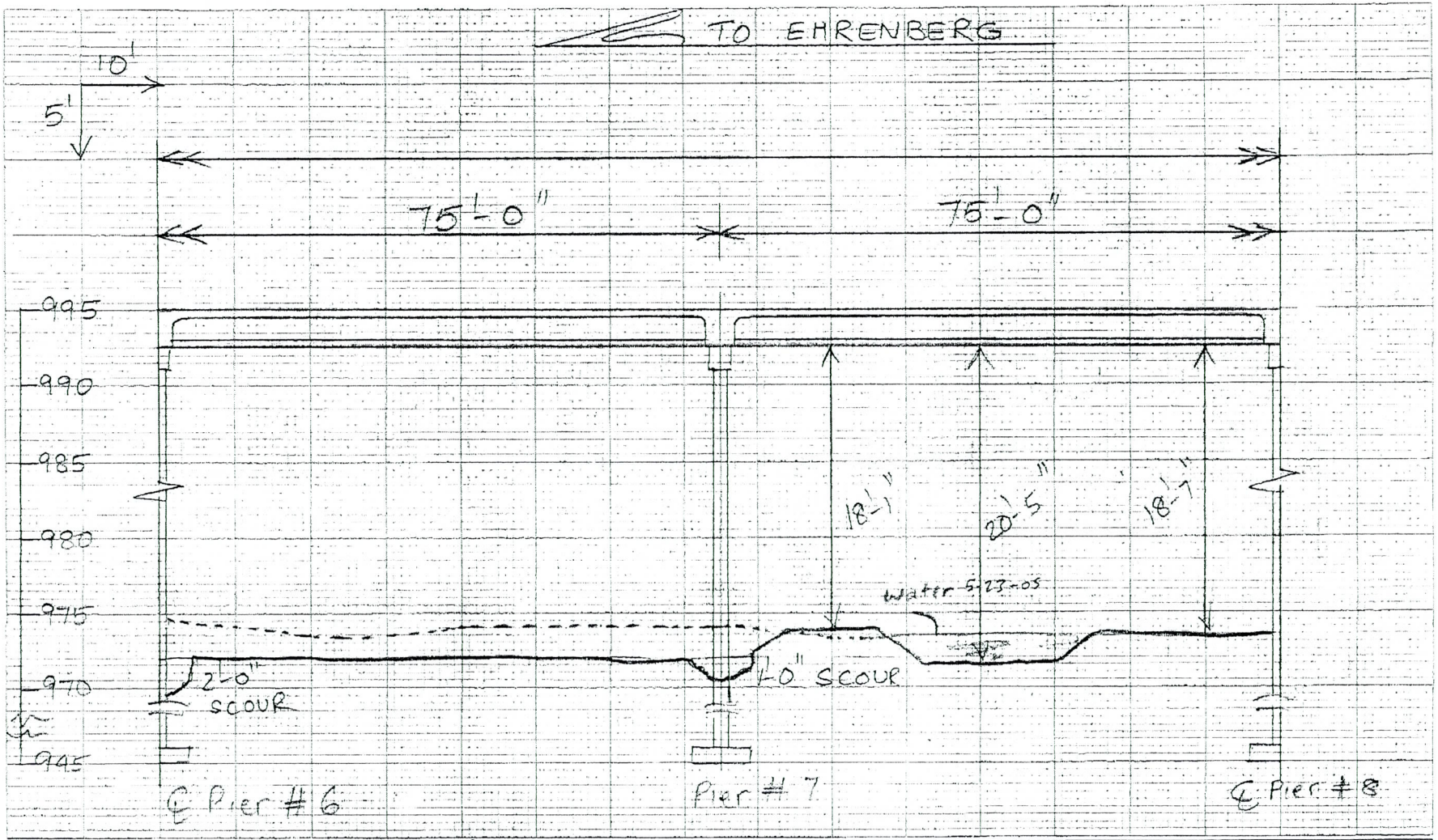
† 64-4505 R04/03

Note: Channel depths will be measured from the bottom of the girder or the slab; For short span (<40'), depths at quarter & three-quarter lengths may not be necessary; Local scour, if observed at locations other than above, will be noted on this sheet with inspection date: RHS-->Right Hand Side; LHS-->Left Hand Side

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 7	Depth at the right side of Support 'P 7	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 8	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	4-10-03	GK	U/S	22'-0"	20'-0"	20'-0"	20'-0"	21'-0"	21'-0"	18'-1"	20'-5"	18'-7"	18'-7"					
13	5-23-05	GK, TD	U/S	17.48'	18.45'	17.86'	17.82'	18.0'	18.0'	18.76'	Not Checked							

† 64-45[illegible] 9/04/03

Note: Channel depths will be measured from the bottom of the girder or the s' For short span (<40'), depths at quarter & three-quarter lengths may not be necessary
Local scour, if observed at locations other than above, will be noted on this s ith inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

Name of Structure: Agua Fria River Bridge (WB)

Structure No. 1853

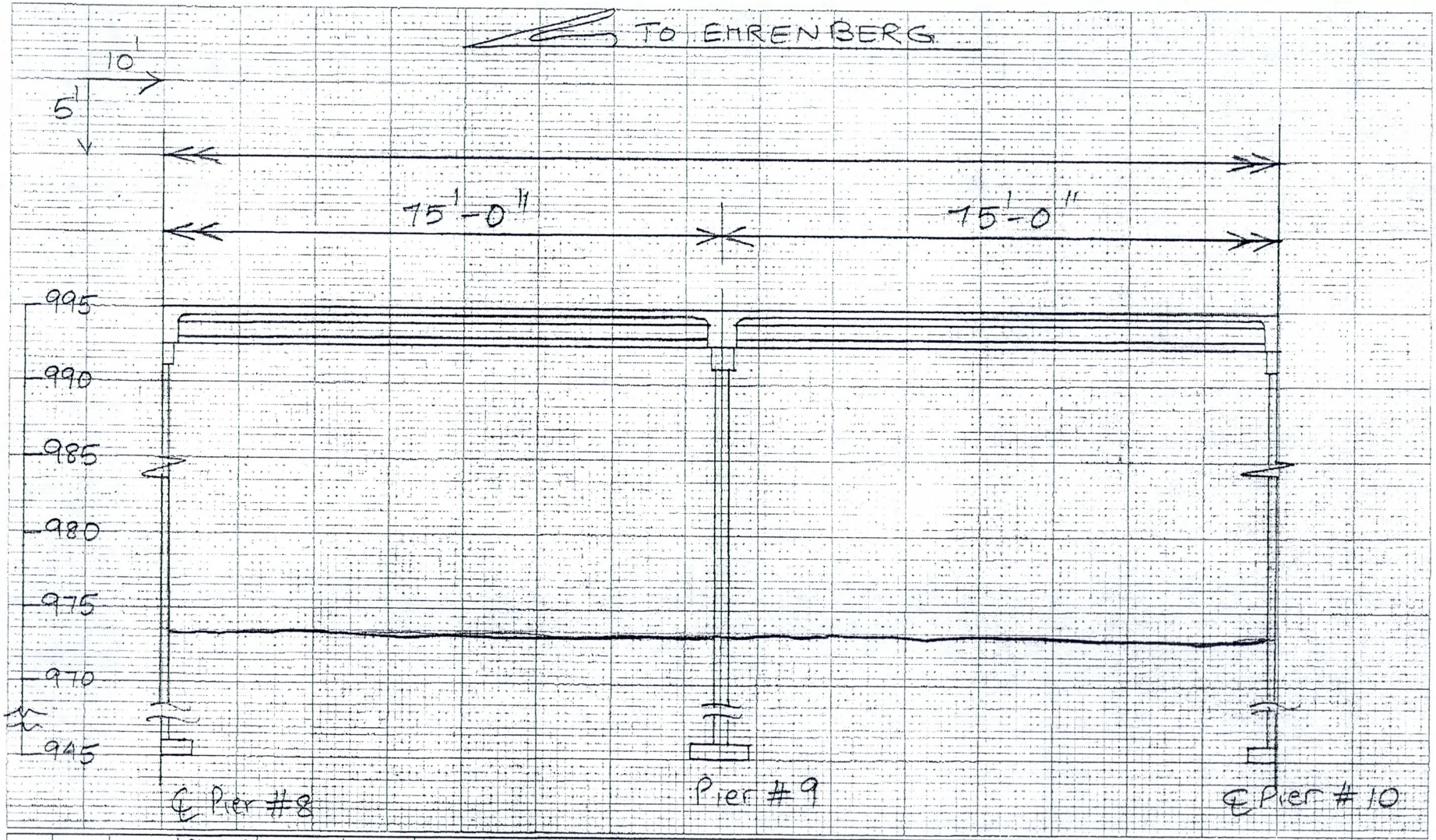
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation

Bridge Group

Supplemental Page to Bridge Inspection Report

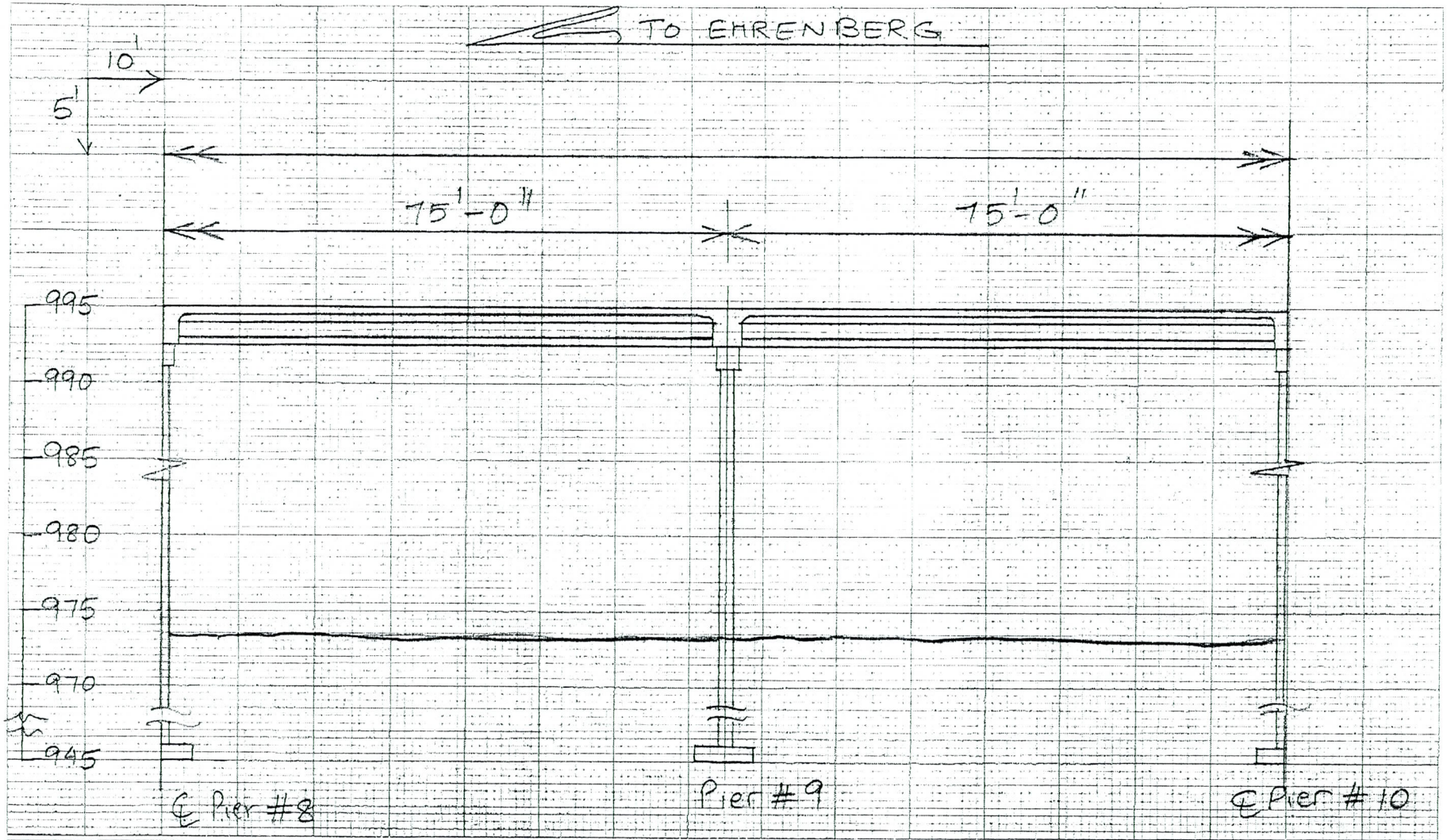


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P9	Depth at the right side of Support 'P9	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P10	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK, TD	U/S	Not Checked due to water Ponding														

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P9	Depth at the right side of Support 'P9	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P10	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK, TD	U/S	Not Checked due to Water Ponding														

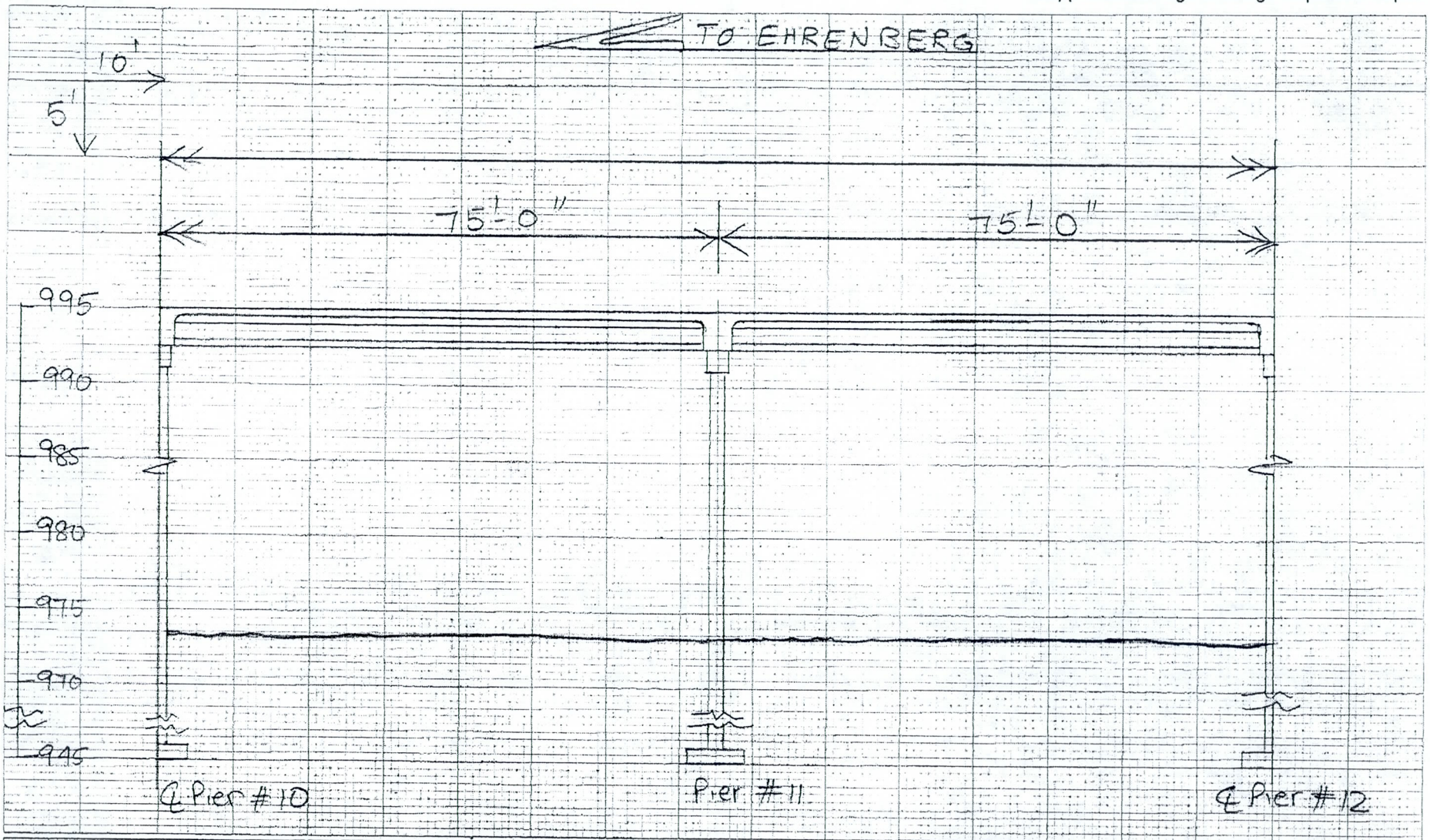
†• 64-4505

Note: Channel depths will be measured from the bottom of the girder or the sl[illegible]r short span (<40'), depths at quarter & three-quarter lengths may not be necessary. Local scour, if observed at locations other than above, will be noted on this sheet with inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report

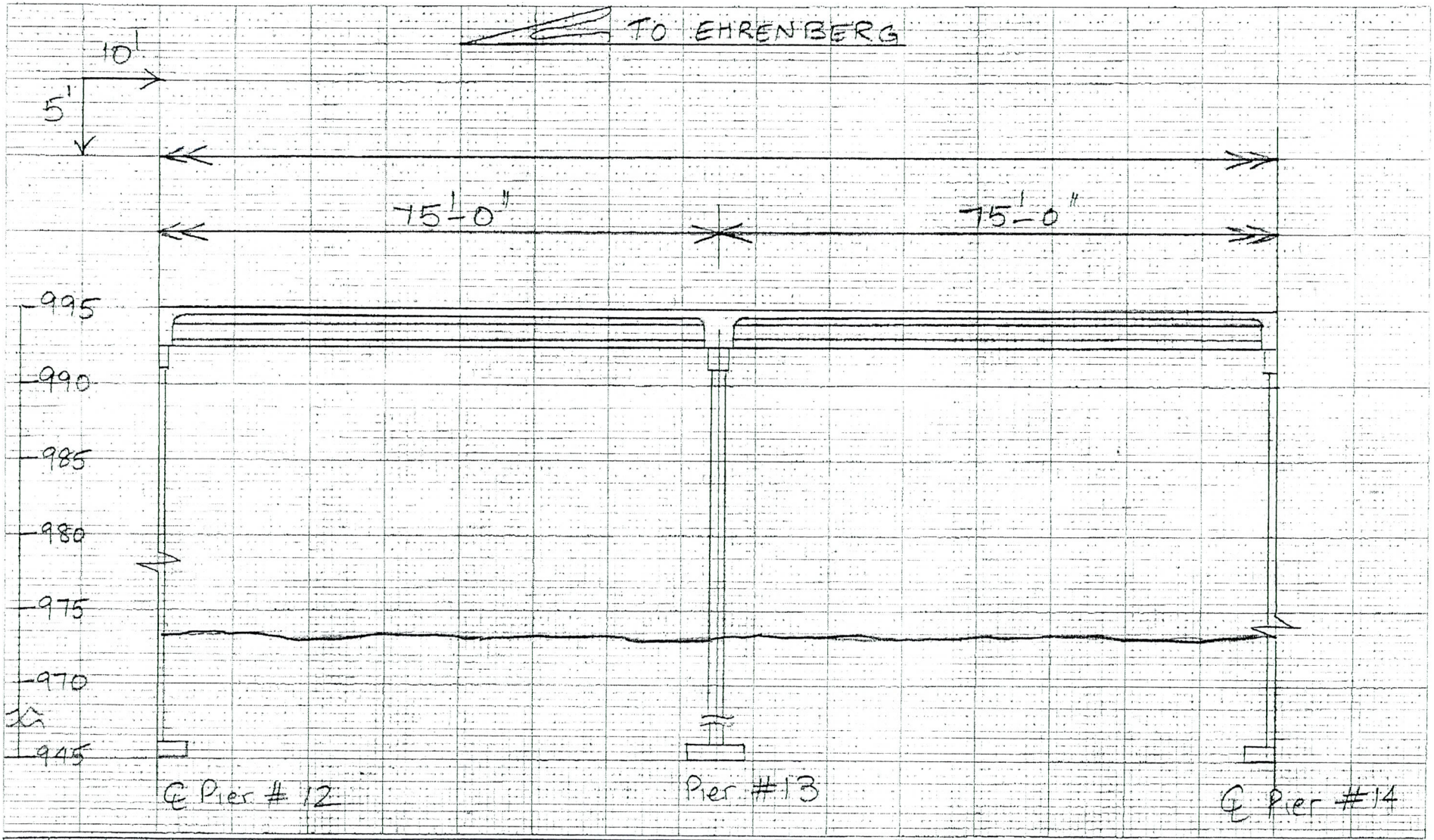


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 1'	Depth at the right side of Support 'P 1'	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 2'	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	5-10-07	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK/TD	U/S	Not Checked due to Water Ponding														

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.070

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



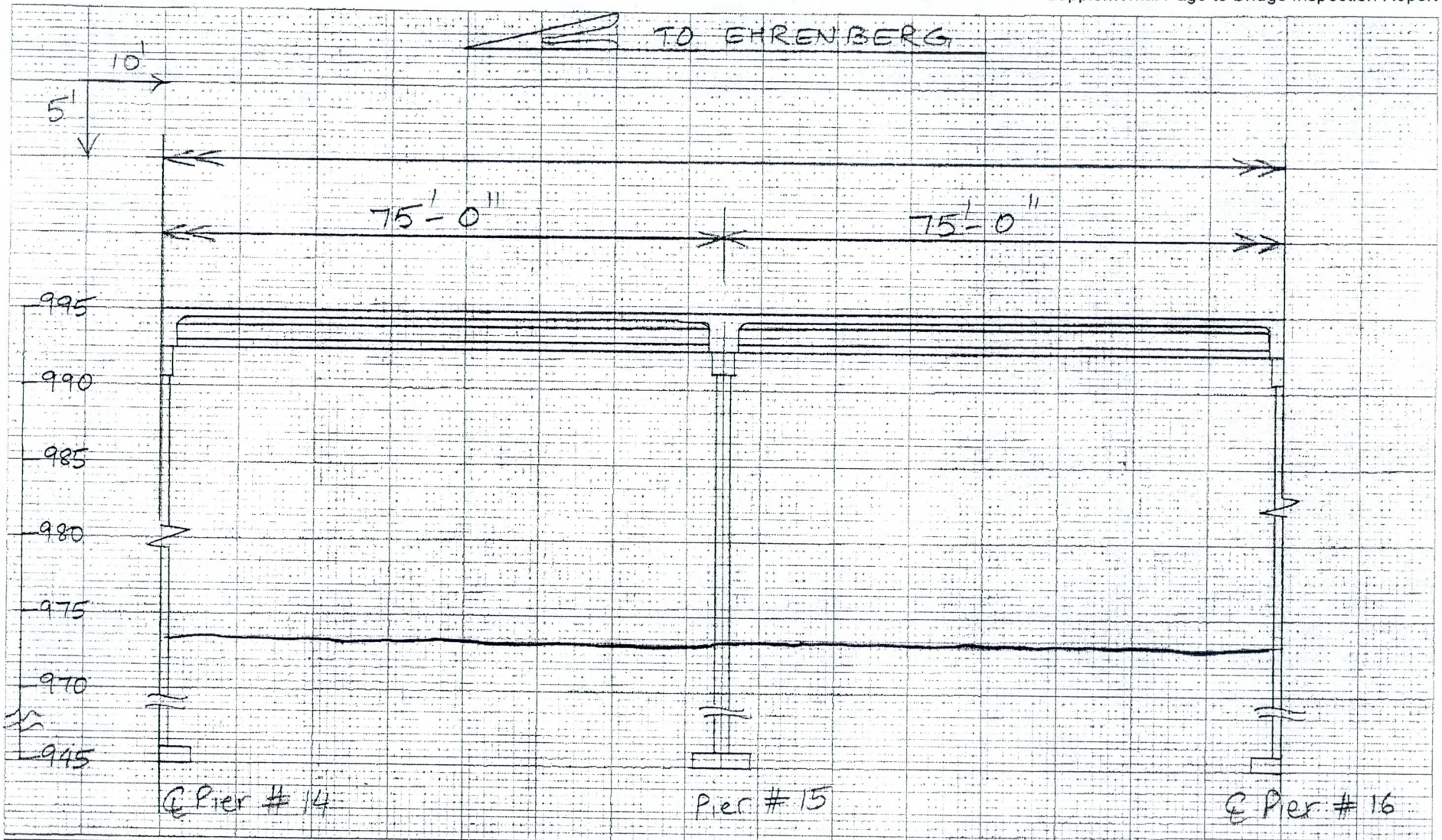
Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 13	Depth at the right side of Support 'P 13	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 14	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	CK/TD	U/S	——	Not	Checked	due	to	Water	Ponding	——							

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Sheet 8 of 10

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report

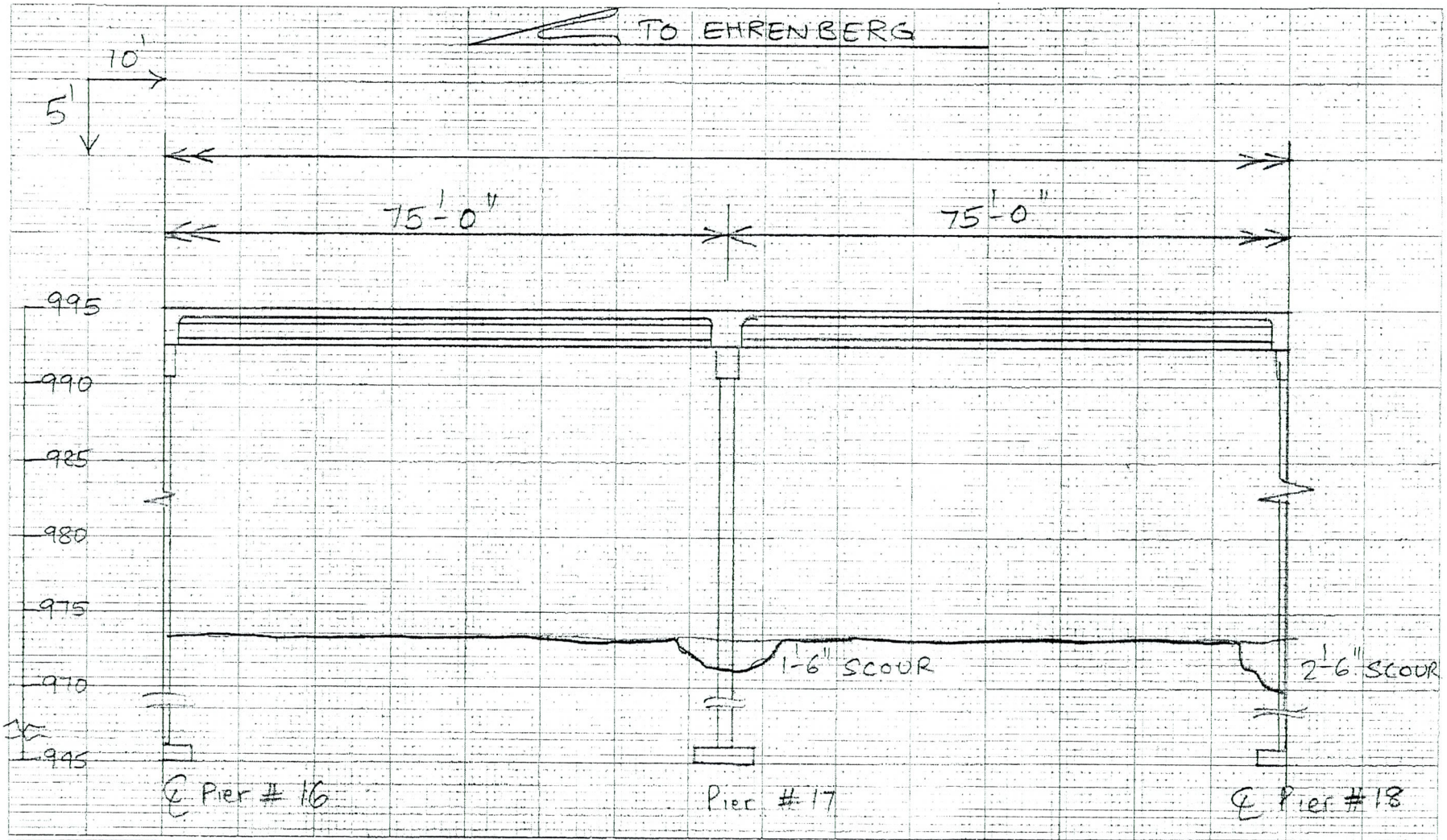


Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 15	Depth at the right side of Support 'P 15	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 16	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"	18'-7"					
13	5-23-05	GK, TD	U/S	Not checked due to water Ponding														

Name of Structure: Agua Fria River Bridge (WB)
Structure No. 1853
Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support, 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 17	Depth at the right side of Support 'P 17	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 18	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	18'-7"	18'-7"	18'-7"	18'-7"	20'-1"	20'-1"	18'-7"	18'-7"	18'-7"	21'-1"					
13	5-21-05	GK/TP	U/S	—	Not	checked due to	Water	Ponding					—					

† 64-450[illegible] 04/03

Note: Channel depths will be measured from the bottom of the girder or the s[illegible] or short span (<40'), depths at quarter & three-quarter lengths may not be necessary
Local scour, if observed at locations other than above, will be noted on this sl[illegible] th inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

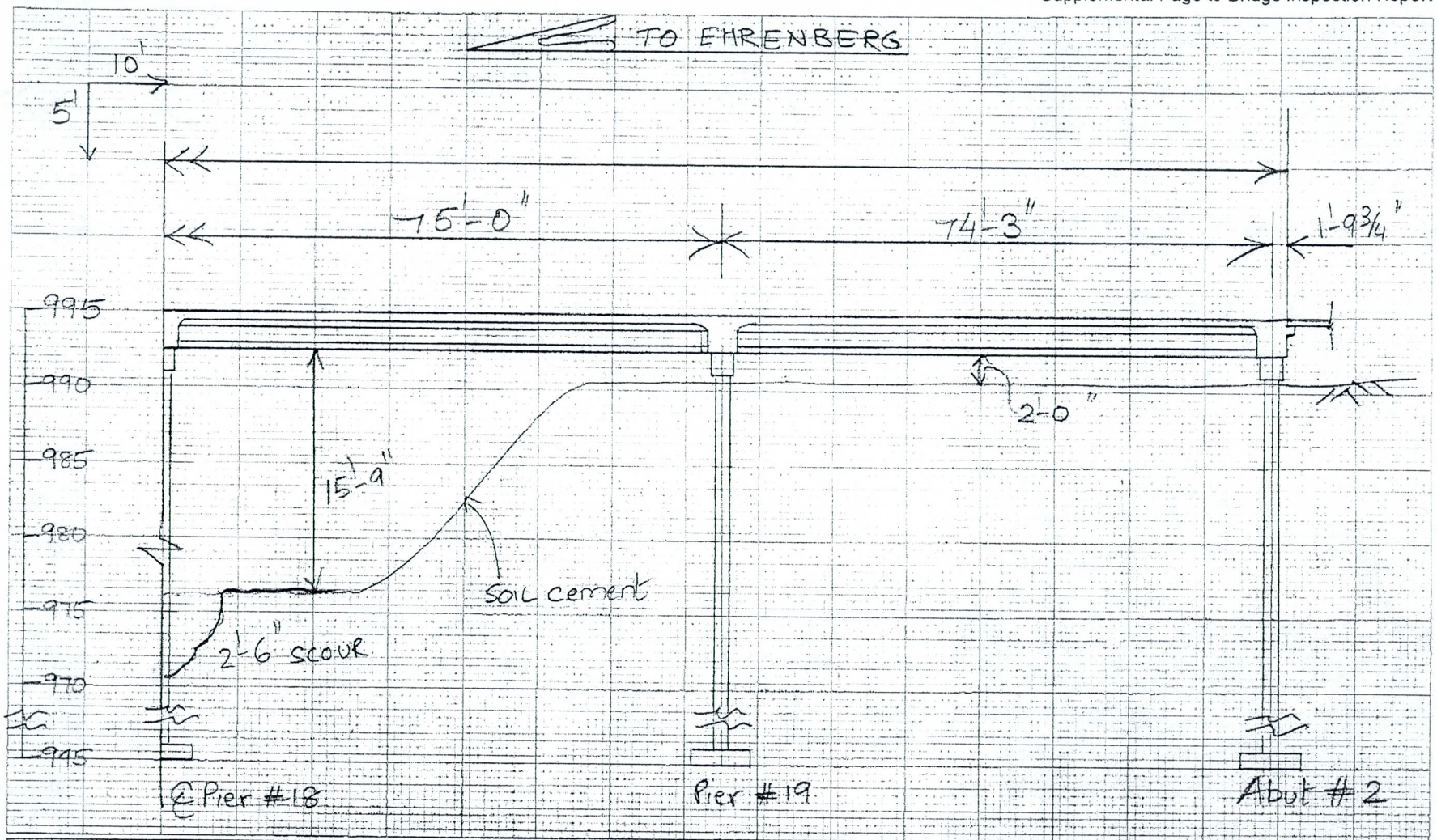
Name of Structure: Agua Fria River Bridge (WB)

Structure No. 1853

Location: Route I-10 MP 130.00

Channel Profile Diagram

Arizona Department of Transportation
Bridge Group
Supplemental Page to Bridge Inspection Report



Insp. No.	Insp. date	Inspector's Initial	Channel Profile Location (U/S or D/S)	Depth at Abut. 'A1' face or at Support 'P '(RHS)	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P 19	Depth at the right side of Support 'P9	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at the left side of Support 'P Abut 2	Depth at the Right side of Support 'P	Depth at quarter span	Depth at mid span	Depth at 3/4 span	Depth at Abut. 'A2' face or at Support, 'P '(LHS)
12	6-10-03	GK	U/S	21-"	17-2"	[illegible]	[illegible]	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"					
13	5-23-05	GK, TO	U/S	Not checked	15.75'	[illegible]	[illegible]	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'					

† 64-4505 R04/03

Note: Channel depths will be measured from the bottom of the girder or the slab; For short span (<40'), depths at quarter & three-quarter lengths may not be necessary; Local scour, if observed at locations other than above, will be noted on this sheet with inspection date; RHS-->Right Hand Side; LHS--> Left Hand Side.

Agua Fria River Bridge Scour Calculations

Source: HDR, *Preliminary Drainage Report, I-10 (Papago) Median Widening, Sarival Avenue to SR 101L in Maricopa County, Arizona*, Appendix E, May 2006.

HDR | ONE COMPANY *Many Solutions™*

Memo

To: Dave Anderson, P.E. Paul Tremel, P.E. Bill Cowdrey, P.E. Trent Kelso, P.E.	
From: Linda Potter, P.E., CFM	Project: MC I-10 West Engineering
CC: David Buras, P.E., L.S.	
Date: September 12, 2005	Job No: 27454

RE: Bridge Scour Evaluation – Interstate 10 over the Agua Fria River

This memorandum presents the results of a bridge scour evaluation for the existing Interstate 10/Maricopa Freeway over the Agua Fria River. The existing bridges over the river are supported by spread footings set at a depth of approximately 24 feet below the existing river bed elevation, or a top of footing elevation at 948.0 (as-built plan datum elevation).

The river has been channelized through this reach, consisting of soil cement levees. The river bottom remains natural, except for numerous grade control structures constructed both upstream and downstream of the I-10 bridge. Reference the attachments and references for additional information on the locations of these structures.

Scour calculations for the bridges were previous calculated by Simons, Li & Associates in 1983. Numerous different methodologies were explored, with the results published as follows for the I-10 bridges:

- 1983 calculated total scour = 14.7 feet

General scour was considered at less than one foot due to the presence of river stabilizing structures in the form of the levees and drop structures. These were designed for the calculated static and dynamic equilibrium slopes for the river.

Bridge Scour Methodology and Results

Although previous scour calculations were performed, conformational scour calculations were conducted by HDR using FHWA's HEC-18 methodology. Prior to performing the calculations, the following information was obtained to check for the performance of the structure since the 1980's:

- Bridge inspection reports
- Soil information
- Most recent Agua Fria HEC-RAS model from the FCDMC and flow estimates
- As-built plans for the bridge structure, levees, and drop structures
- Discussions with ADOT staff

A new D50 was developed for use in the calculations of 0.66 mm (reference attached D50 estimate memo). Additionally, an allowance of an extra 4 feet for debris was added to the pier width to provide a factor of safety.

The most recent flow estimates were obtained from the Flood Control District of Maricopa County (FCDMC) and used in the calculations. The adopted 100-year flow estimate at the I-10 bridge obtained from the FCDMC is 52,000 cfs. Additionally, the 1989 Standard Project Flood of 99,000 cfs was used as the 500-year flow estimate for scour calculations. This will provide slightly conservative results compared with the ADOT methodology of obtaining the 500-year flow by multiplying the 100-year flow by 1.7, which results in 88,400 cfs. The 1983 report used 95,000 cfs as the 100-year estimate for all scour calculations, and did not examine

the 500-year flood. The previous hydrology estimate is much higher than the current flow estimate as it was based on a 1981 US Army Corps of Engineers' study performed prior to the construction of the New Waddell Dam.

Additionally, the 1983 report indicated that the bend in the river just upstream of the I-10 bridge may cause a higher unit discharge near the western portion of the bridge (excerpts from this report are attached). The recommendation was to construct a riprap blanket extending 20 feet in all directions around the piers. Conversations with ADOT staff indicated that riprap was placed around the western piers, although the exact placement and depth was not verified.

Bridge inspection results did not reveal any trend in bed elevation changes. Small 2-foot deep scour holes were seen around the piers. These inspection reports are attached.

The scour calculations performed with the aforementioned changes result in the following new scour estimates at the bridge piers:

Event	General Scour, ft	Local Scour, ft	Total Scour, ft
100-year	1.2	11.5	**12.7**
500-year	1.2	13.6	**14.9**

Conclusions

Scour calculations indicate that the existing spread footings are not likely to be undermined by scour during the 100-year and 500-year runoff events, due to the river stabilization activities that have been performed in the Agua Fria River. An existing grade control structure located 500-feet downstream from I-10 bridges is anticipated to control general degradation of the river bed to less than a foot. However, due to the upstream bend in the river, we recommend that the presence of the riprap blanket around the piers for the western one-half of the structure be confirmed. This should include the extents, depth, D50/gradation of the rock, and filter blanket properties. If the riprap is found to be substandard or not placed, it should be repaired or added as necessary to all of the piers located on the western one-half of the structure.

References

Flood Control District of Maricopa County, Current Planning HEC-RAS model for the Agua Fria River, adopted 2001.

HDR, Inc. Memo from Nick LaFronz to Linda Potter, *Estimate of D50 Particle Size Agua Fria River Sediment Samples Preliminary Scour Assessment I-10 Bridges of Agua Fria River.* September 2005.

Simons, Li & Associates, Inc. *Final Report System Analysis and Conceptual Design of Channelization in the Agua Fria River.* Flood Control District of Maricopa County, October 1983.

U.S. Department of Transportation, Federal Highway Administration, Publication No. FHWA NHI 01-001, Hydraulic Engineering Circular No. 18, *Evaluating Scour at Bridges,* Fourth Edition, May 2001.

West Consultants, Inc. *Modeling Sediment Transport in the Agua Fria River.* Flood Control District of Maricopa County, March 2002.

Job No. 27454 No.

Computation

HDR

Project	ADOT I-10 West		Computed	LAP	Date 8/25/2005
Subject	I-10 Bridge over the Agua Fria River		Checked	DWB	Date 9-12-05
Task	100-year flow estimated scour computations		Sheet		Of

Clear water or live bed scour
The following formula is an indicator for determining either clear water or live bed scour. If the resulting V_c is less than the average velocity in the flood channel, then live bed scour is indicated.

V_c = critical velocity above which bed material of size D_{50} and smaller will be transported, ft/s
D_{50} = 0.0023 (median diameter of bed material, ft) (From: HDR, 2005)
y = 5.64 (depth of flow, ft) 100-year From: HEC-RAS planning model, 4/24/01

$V_c = 11.17(y^{.1667})(D50^{.333})$
V_c = 2.03 ft/s 100-year $V_{avg.}$ = 7.47 ft/s

100-year
General Scour, long-term degradation = 1 ft From: System Analysis and Conceptual Design of Channelization in the Agua Fria River, Simons, Li, & Assoc., 1983

100-year

Live-bed Contraction Scour Case 2

y_1 = avg. depth in u.s. main channel, ft
y_2 = avg. depth in contracted chan., ft
W_1 = bottom width, u.s. main channel, ft
W_2 = bottom width, main channel in contracted sect., ft
y_s = avg. scour depth, y_2-y_1
Q_1 = flow in u.s. channel, cfs
Q_2 = flow in contracted channel, cfs

y_1 =	5.64	W_2 =	1437	k_1 =	0.64
y_2 =	solve for	Q_1 =	52000		
W_1 =	1500	Q_2 =	52000		

$y_2/y_1=(Q_2/Q_1)^{.857}(W_1/W_2)^{k_1}$

y_2/y_1 = 1.03 y_2 = 5.80 feet
y_s = 0.2 feet (contraction scour) 0.05 meters

100-year
Pier scour (Clear-water or Live-bed)

y_s = scour depth, ft	
y_1 = flow depth directly upstream of pier, ft	5.64
K1 = corr. factor for pier nose shape	1
K2 = corr. factor for angle of attack (15 deg.)	1
K3 = corr. factor for bed condition	1.1
a = pier width, ft (+ 4' debris)	7.3
L = length of pier, ft	15.2 (assume 2' debris on upstream pier)
Fr_1 = Froude number = $V_1/(gy_1)^{.5}$	0.57
V_1 = mean flow velocity directly upstream of pier, ft/s	7.5

$y_s/y_1 = 2.0\ K1\ K2\ K3\ (a/y_1)^{.65}\ Fr_1^{.43}$ = 2.04
y_s = 11.5 feet (pier scour) 3.51 meters 23 feet (est. scour top width)

100-year
Total Scour = 12.7 feet

Plan: FP/FW Agua Fria 1 RS: 5.2975 Profile: PF 1

E.G. US. (ft)	977.95	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	977.29	E.G. Elev (ft)	977.93	977.76
Q Total (cfs)	52000.00	W.S. Elev (ft)	977.14	976.90
Q Channel (cfs)	52000.00	Crit W.S. (ft)	975.20	975.20
Q Left (cfs)		Max Chl Dpth (ft)	5.64	5.40
Vel Chnl (ft/s)		Vel Total (ft/s)	7.15	7.47
Vel Left (ft/s)		Flow Area (sq ft)	7270.10	6958.57
Vel Right (ft/s)		Froude # Chl	0.53	0.57
W.S. Wgt Intg (ft)		Specif Force (cu ft)	31989.88	30800.49
W.S. Total Wgt (ft)	994.51	Hydr Depth (ft)	5.60	5.36
Min Ch El (ft)	989.40	W.P. Total (ft)	1516.50	1506.46
Delta EG (ft)	0.22	Conv. Total (cfs)	1023797.0	955952.5
Delta WS (ft)	0.30	Top Width (ft)	1299.14	1298.35
Flow Area (sq ft)	21349.79	Frctn Loss (ft)	0.16	0.00
Br Sel Method	7.47	C & E Loss (ft)	0.01	0.04
Control		Shear Total (lb/sq ft)	0.77	0.85
Br Sel Method	Energy only	Power Total (lb/ft s)	5.52	6.38

Job No. 27454 No.

Computation

HDR

Project	ADOT I-10 West	Computed	LAP	Date	8/25/2005
Subject	I-10 Bridge over the Agua Fria River	Checked	DWB	Date	9-12-05
Task	500-year flow estimated scour computations	Sheet	1	Of	

Clear water or live bed scour
The following formula is an indicator for determining either clear water or live bed scour. If the resulting Vc is less than the average velocity in the flood channel, then live bed scour is indicated.

Vc = critical velocity above which bed material of size D50 and smaller will be transported, ft/s
D50 = 0.0023 (median diameter of bed material, ft) (From: HDR, 2005)
y = 8.09 (depth of flow, ft) 500-year From: HEC-RAS planning model, 4/24/01

Vc = 11.17(y^.1667)(D50^.333)
Vc = 2.16 ft/s 500-year Vavg. = 9.85 ft/s
Vc<Vavg, use live bed equation

500-year (No channelization)
General Scour, long-term degradation = 1 ft From: System Analysis and Conceptual Design of Channelization in the Agua Fria River, Simons, Li, & Assoc., 1983

500-year

Live-bed Contraction Scour Case 2

y_1 = avg. depth in u.s. main channel, ft
y_2 = avg. depth in contracted chan., ft
W_1 = bottom width, u.s. main channel, ft
W_2 = bottom width, main channel in contracted sect., ft
y_s = avg. scour depth, y_2-y_1
Q_1 = flow in u.s. channel, cfs
Q_2 = flow in contracted channel, cfs

y_1 =	8.09	W_2 =	1437	k_1 =	0.64
y_2 =	solve for	Q_1 =	99000		
W_1 =	1500	Q_2 =	99000		

$y_2/y_1=(Q_2/Q_1)^{.857}(W_1/W_2)^{k_1}$

y_2/y_1 = 1.03 y_2 = 8.32 feet
y_s = 0.2 feet (contraction scour) 0.07 meters

500-year
Pier scour (Clear-water or Live-bed)

y_s = scour depth, ft	
y_1 = flow depth directly upstream of pier, ft	8.09
K1 = corr. factor for pier nose shape	1
K2 = corr. factor for angle of attack (15 deg.)	1
K3 = corr. factor for bed condition	1.1
a = pier width, ft (+ 4' debris)	7.3
L = length of pier, ft	15.2 (assume 2' debris on upstream pier)
Fr_1 = Froude number = $V_1/(gy_1)^{.5}$	0.63
V_1 = mean flow velocity directly upstream of pier, ft/s	9.46

y_s/y_1 = 2.0 K1 K2 K3 $(a/y_1)^{.65}$ $Fr_1^{.43}$ = 1.69
y_s = 13.6 feet (pier scour) 4.16 meters 27 feet (est. scour top width)

500-year
Total Scour = 14.9 feet

Plan: FP/FW Agua Fria 1 RS: 5.2975 Profile: PF 1

E.G. US. (ft)	981.01	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	979.87	E.G. Elev (ft)	980.98	980.78
Q Total (cfs)	99000.00	W.S. Elev (ft)	979.59	979.27
Q Bridge (cfs)	99000.00	Crit W.S. (ft)	977.16	977.16
Q Weir (cfs)		Max Chl Dpth (ft)	8.09	7.77
Weir Sta Lft (ft)		Vel Total (ft/s)	9.46	9.85
Weir Sta Rgt (ft)		Flow Area (sq ft)	10465.44	10055.34
Weir Submerg		Froude # Chl	0.59	0.63
Weir Max Depth (ft)		Specif Force (cu ft)	71262.73	69228.76
Min El Weir Flow (ft)	994.51	Hyd Depth (ft)	8.01	7.70
Min El Prs (ft)	989.40	W.P. Total (ft)	1619.12	1605.98
Delta EG (ft)	0.30	Conv. Total (cfs)	1798667.0	1691901.0
Delta WS (ft)	0.43	Top Width (ft)	1307.21	1306.18
BR Open Area (sq ft)	21349.79	Frict Loss (ft)	0.19	0.00
BR Open Vel (ft/s)	9.85	C & E Loss (ft)	0.01	0.07
Coef of Q		Shear Total (lb/sq ft)	1.22	1.34
Br Sel Method	Energy only	Power Total (lb/ft s)	11.56	13.18

HDR | ONE COMPANY *Many Solutions℠*

Memo

To: Linda Potter, P.E.	
From: Nick LaFronz, P.E.	Project: I-10 West Widening
CC:	
Date: September 9, 2005	Job No: 000000000027454

RE: Estimate of D_{50} Particle Size
Agua Fria River Sediment Samples
Preliminary Scour Assessment
I-10 Bridges over Agua Fria River

Introduction

Presented herein is a summary of available, existing geotechnical data prepared in support of the preliminary scour assessment of the existing Interstate 10 (I-10) eastbound and westbound bridges over the Agua Fria River. Existing geotechnical data, in the form of results of laboratory soils tests on sediment samples from the river channel bed, was obtained from previous geotechnical investigation reports and scour assessment studies. The summary was prepared in order to develop an estimate of the value of D_{50} (soil particle diameter for which 50 percent of the soil by weight is finer, i.e., of lesser diameter) for the channel bed sediment. The reviewed reports and documents are listed in the References section of this memorandum.

Results of Laboratory Testing of Sediment Samples

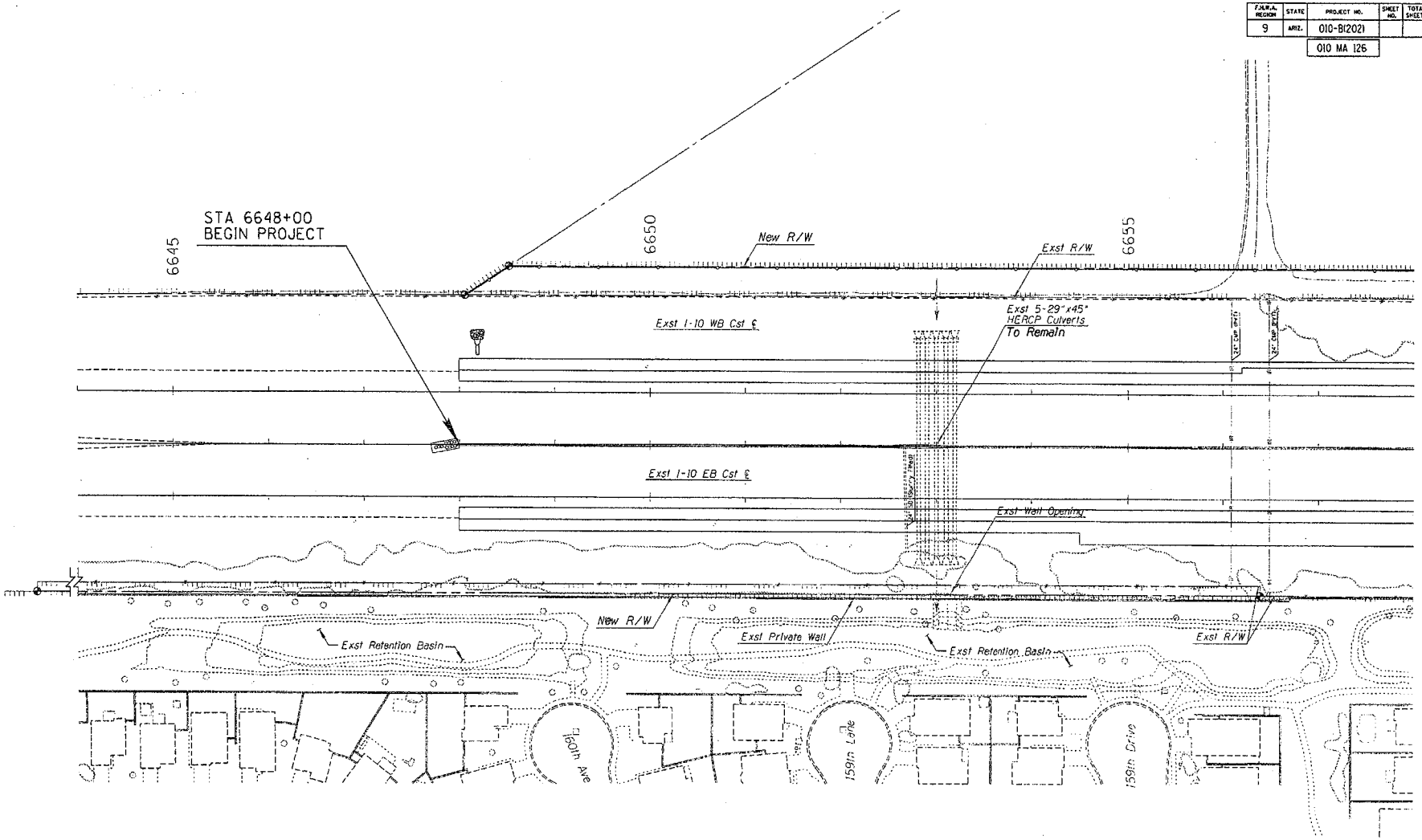
Presented in Table 1 are the results of grain-size analyses (sieve analyses) of sediment samples obtained from the Agua Fria River, channel bed. Locations of the samples extend from north of the Jomax Road alignment on the north end, to Southern Avenue near the confluence with the Gila River on the south. Generally, depth of the samples was described as being within the upper 5 feet, measured from existing channel bed grade at the time of sampling. Data in the table includes the sample data source (as listed in the References section), the sample number or designation, the value of D_{50}, the approximate sample location, and clarifying remarks. As noted, the sediment sample locations listed in Table 1 are considered approximate, either due to inconsistencies between data sources (river mile measurements), or due to a lack of specific sample location information in the specific report from which the data was derived.

Statistical analysis of D_{50} values relevant to the I-10 bridges was confined to those samples within to the segment of river channel extending from Buckeye to Thomas Roads, encompassing 14 data points. The computed, average value of D_{50} for this segment, excluding what appears to be an obvious outlier value of 4.00 millimeters (mm) was 0.66 mm, with a standard deviation of 0.15 mm. As shown in Table 1, the 0.66-mm particle fall within the lower portion of the range for medium-grained sand particle sizes.

APPENDIX I

ONSITE DRAINAGE AREAS

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6648+00 to 6658+00

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG NO
I-10	SARIVAL AVE TO DYSART RD	D-02.01
TRACS NO. H7296 01C		010-B(202)

OF

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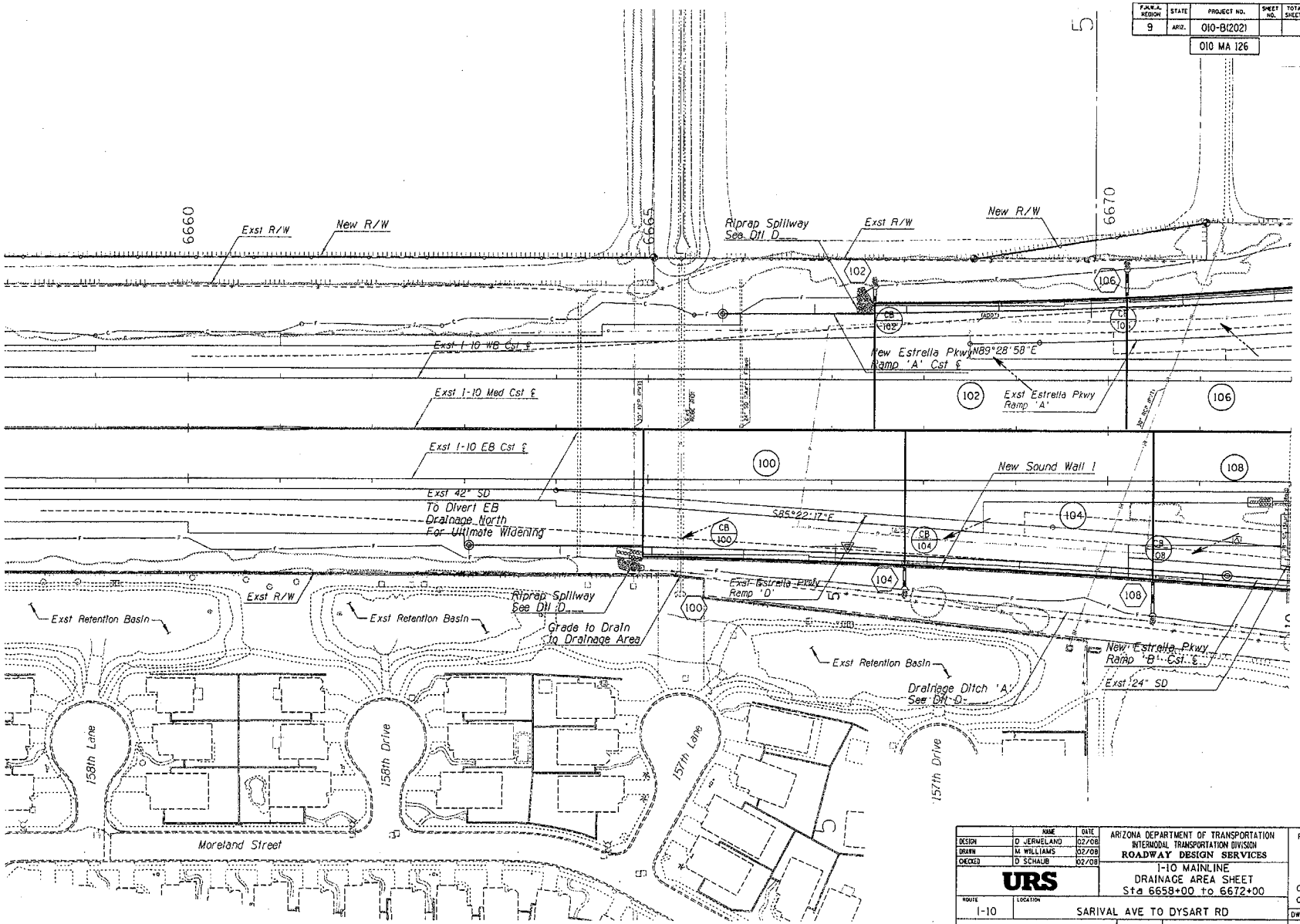

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELANO	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6658+00 to 6672+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.02

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SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE | SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE

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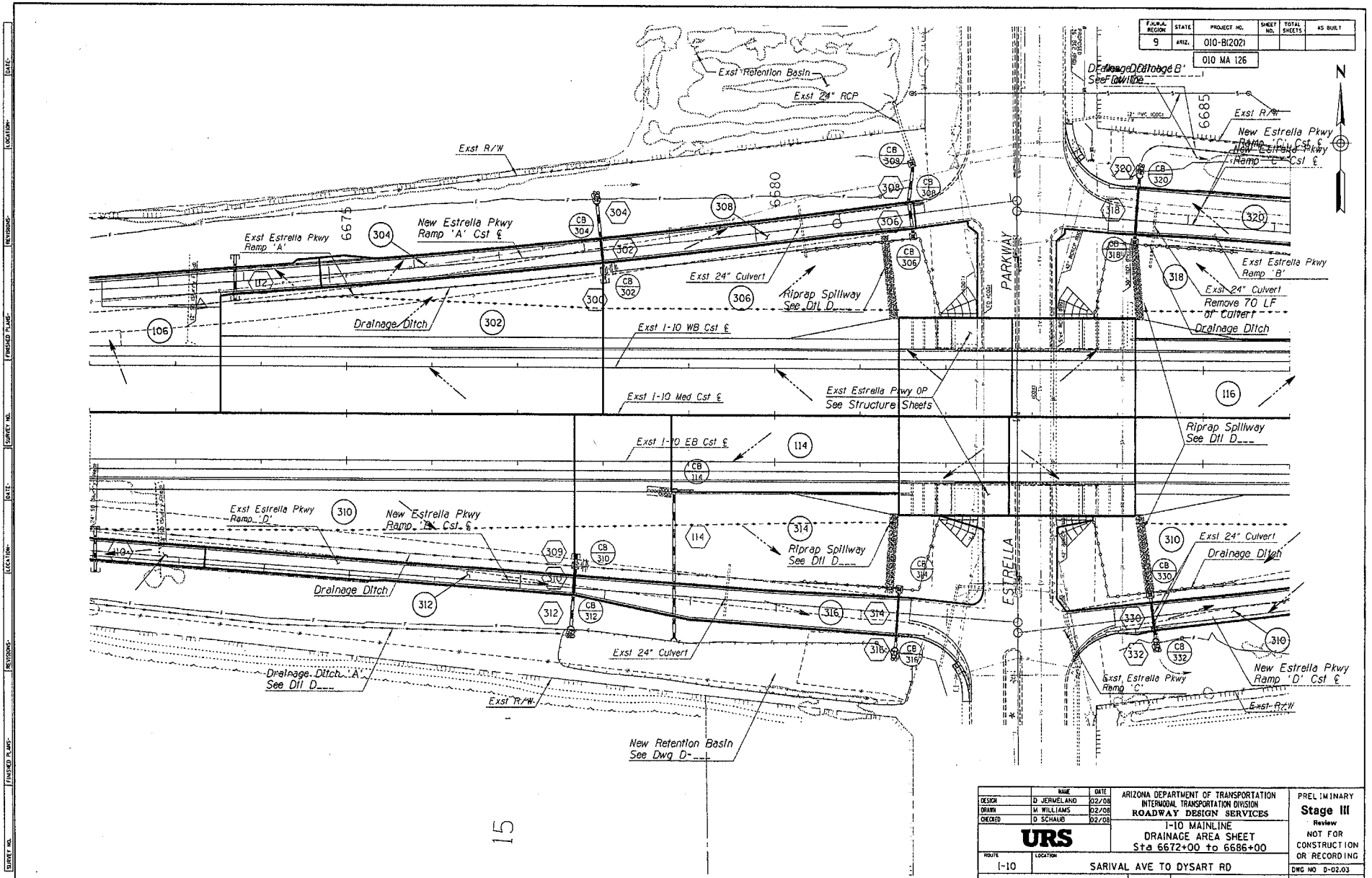

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6672+00 to 6686+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.03

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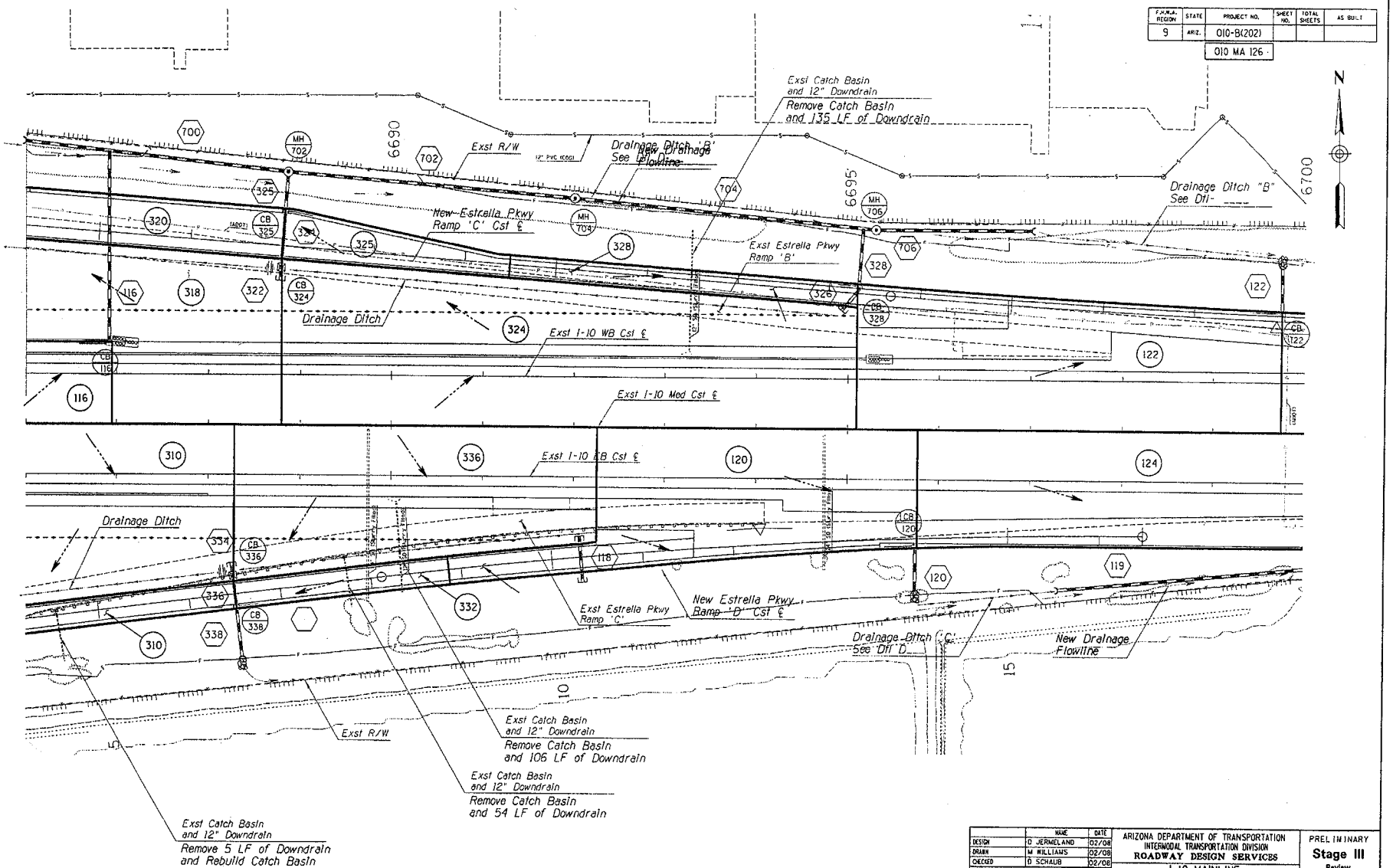

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6686+00 to 6700+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.04

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F.A.P.M.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
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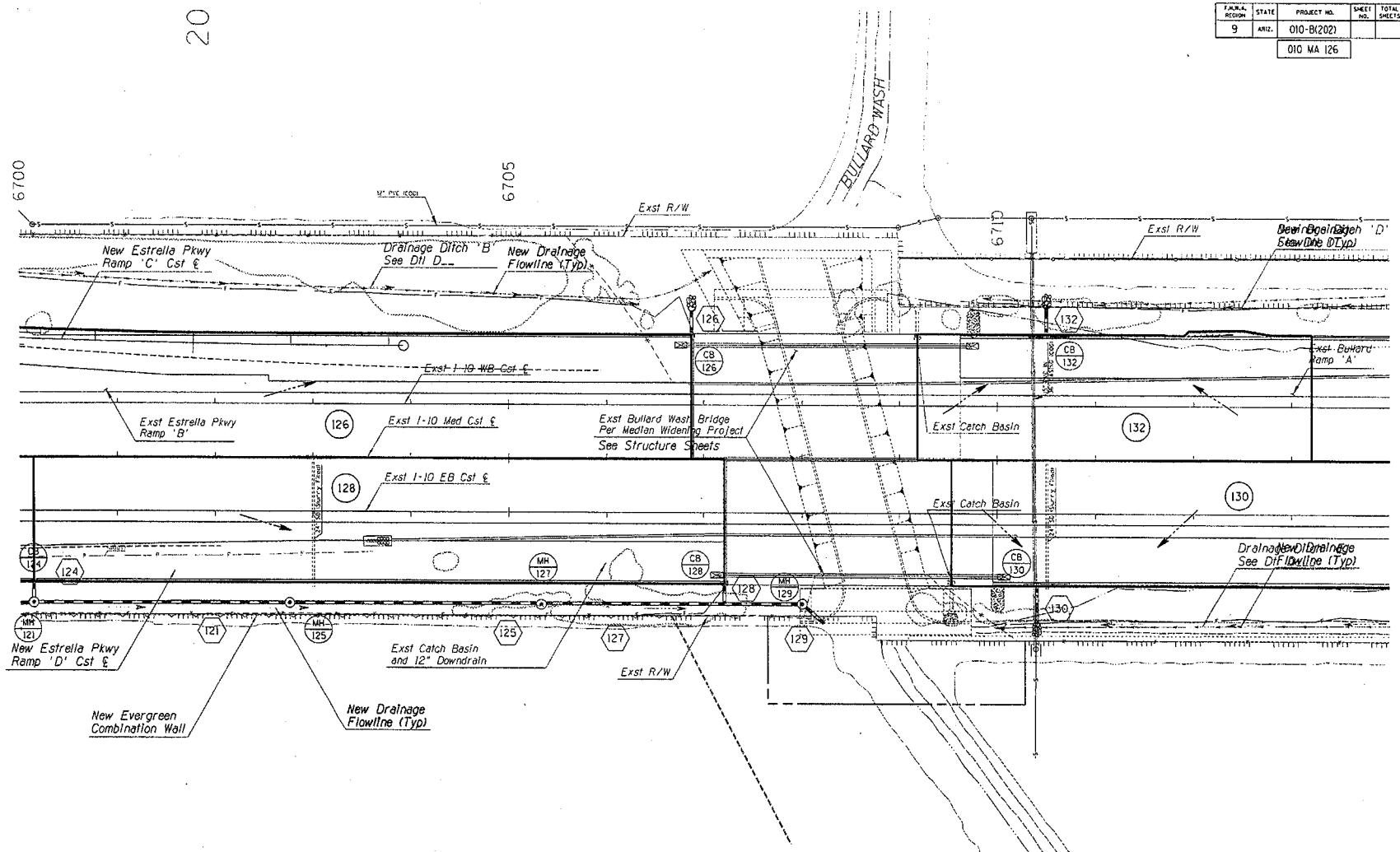
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6700+00 to 6714+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C 010-B(202)

PRELIMINARY
Stage III
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NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.05

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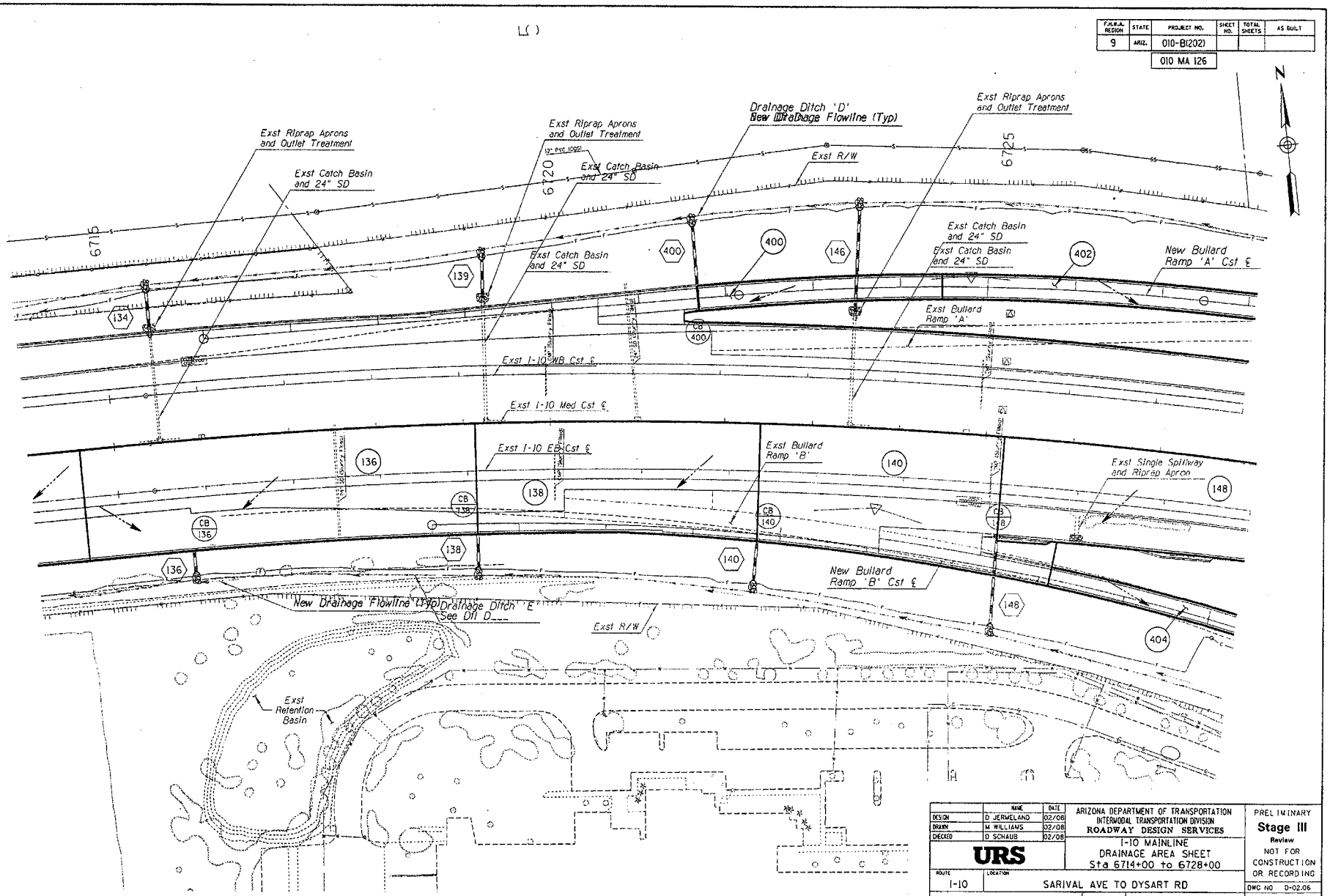

F.A.H.P.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6714+00 to 6728+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.06

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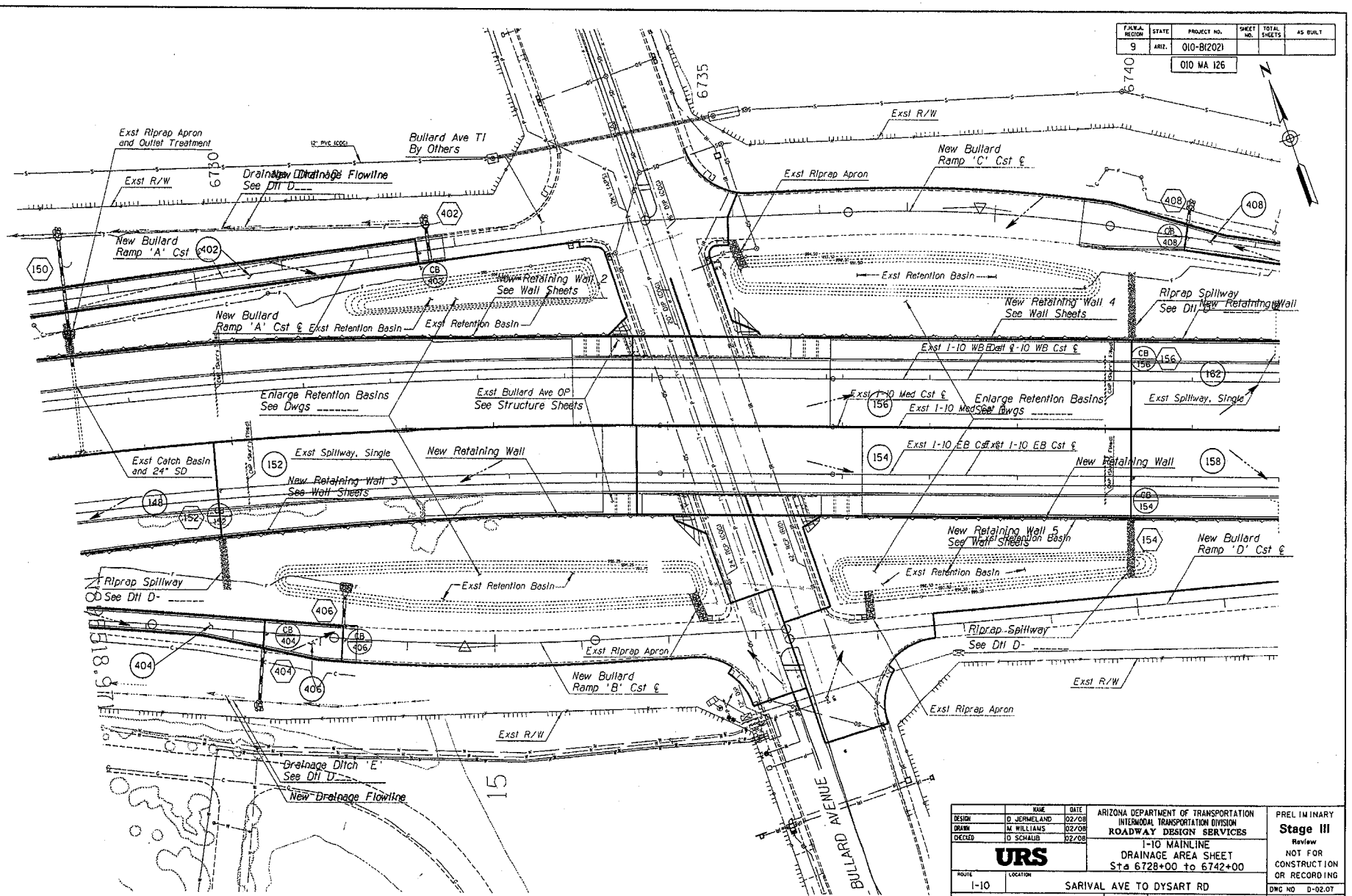
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Exst R/W
Bullard Ave TI By Others
12" PVC (CDC)
Drainage Ditch 'C' See Dtl D-
New Drainage Flowline
New Bullard Ramp 'A' Cst
New Retaining Wall 2 See Wall Sheets
New Bullard Ramp 'A' Cst & Exst Retention Basin
Exst Retention Basin
Enlarge Retention Basins See Dwgs
Exst Bullard Ave OP See Structure Sheets
Exst Catch Basin and 24" SD
Exst Spillway, Single
New Retaining Wall 3 See Wall Sheets
New Retaining Wall
Riprap Spillway See Dtl D-
Exst Riprap Apron
New Bullard Ramp 'B' Cst &
Exst R/W
Drainage Ditch 'E' See Dtl D-
New Drainage Flowline
BULLARD AVENUE
New Bullard Ramp 'C' Cst &
Exst Riprap Apron
Exst R/W
Exst Retention Basin
New Retaining Wall 4 See Wall Sheets
Riprap Spillway See Dtl D-
New Retaining Wall
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Exst I-10 Med Cst See Dwgs
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Exst Spillway, Single
Exst I-10 EB Cst & I-10 EB Cst &
New Retaining Wall
New Retaining Wall 5 See Wall Sheets
Exst Retention Basin
New Bullard Ramp 'D' Cst &
Riprap Spillway See Dtl D-
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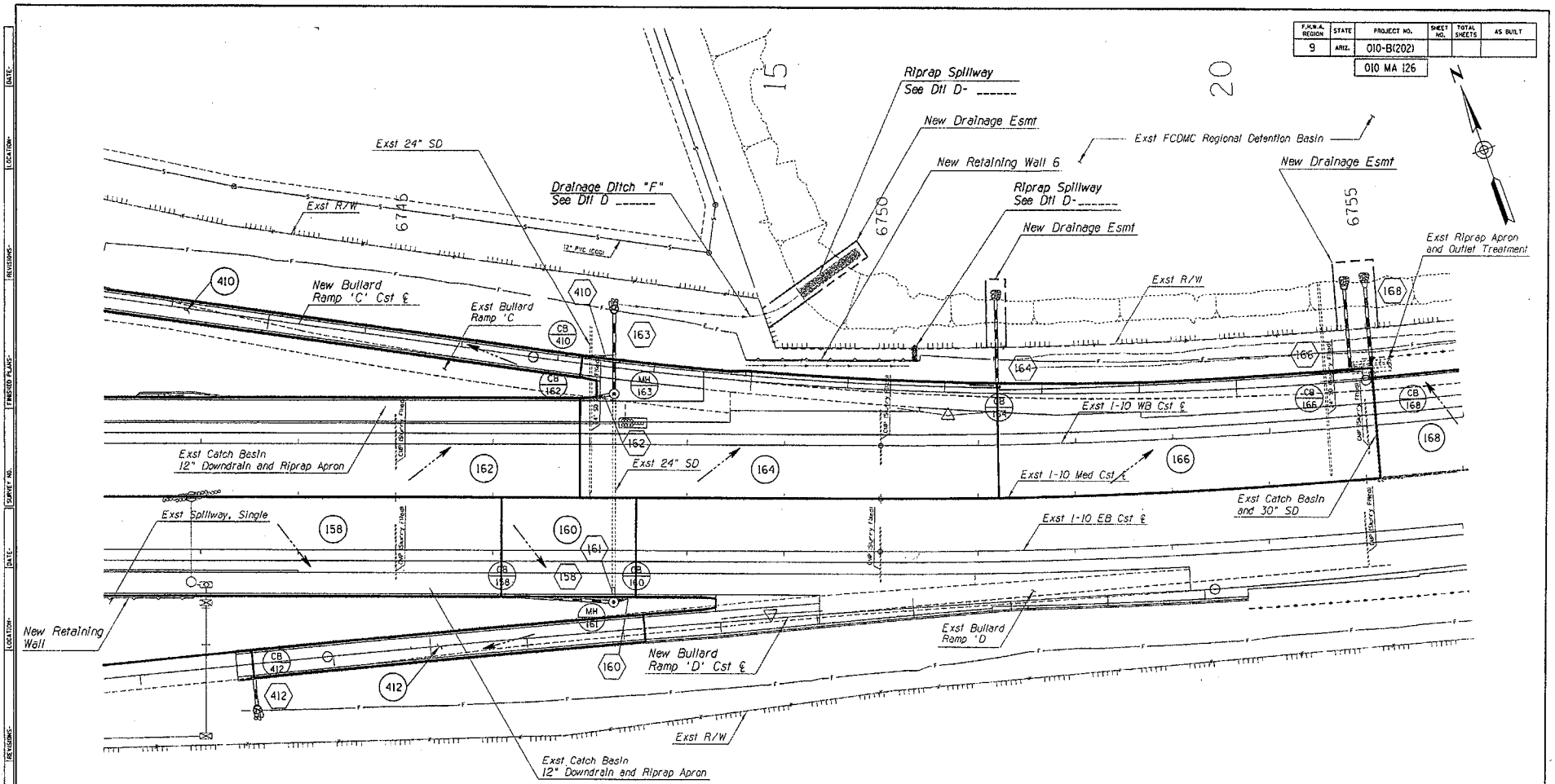

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6742+00 to 6756+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO 0-02.08

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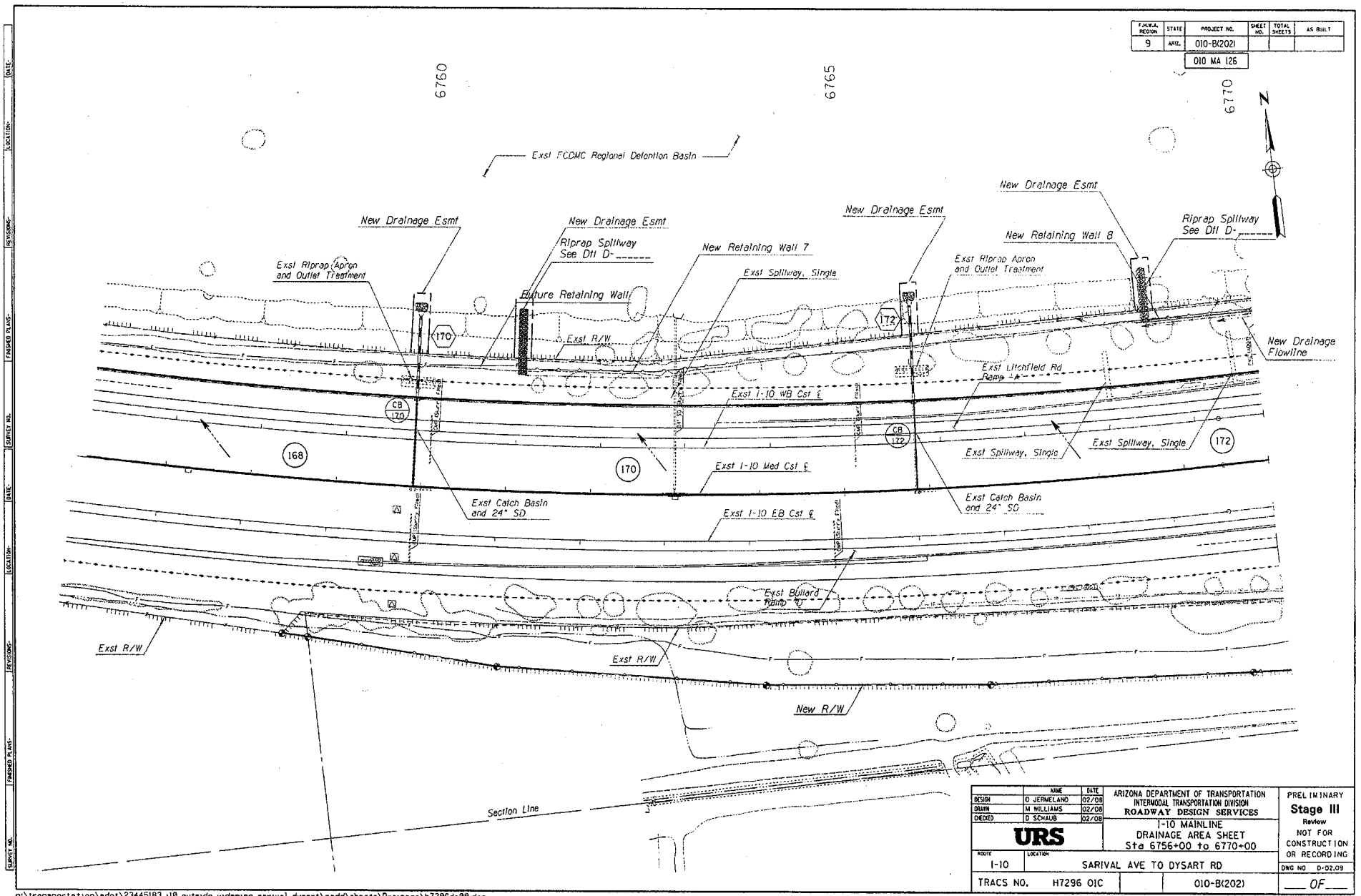
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			



	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6756+00 to 6770+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.09

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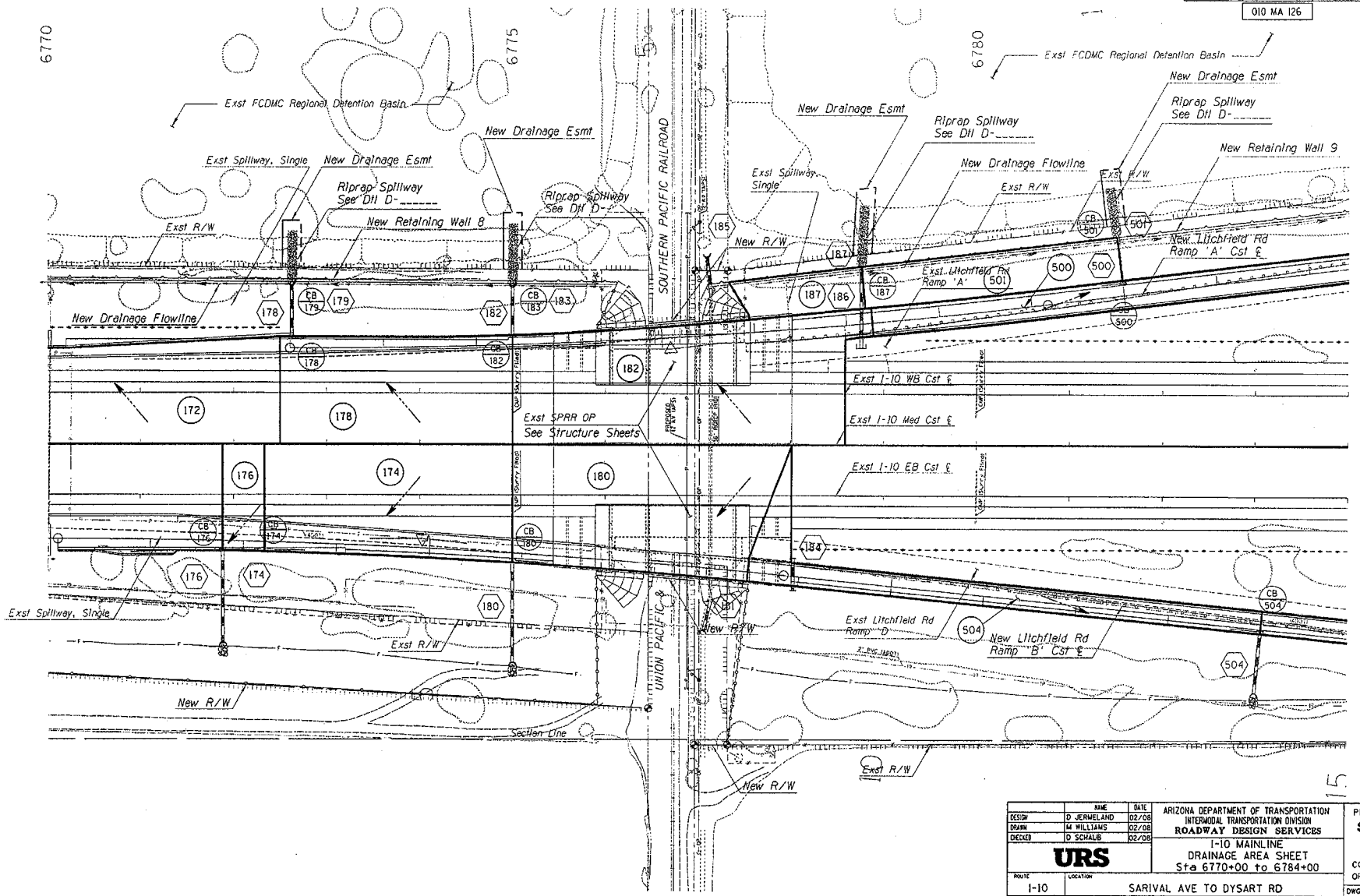

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6770+00 to 6784+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.10

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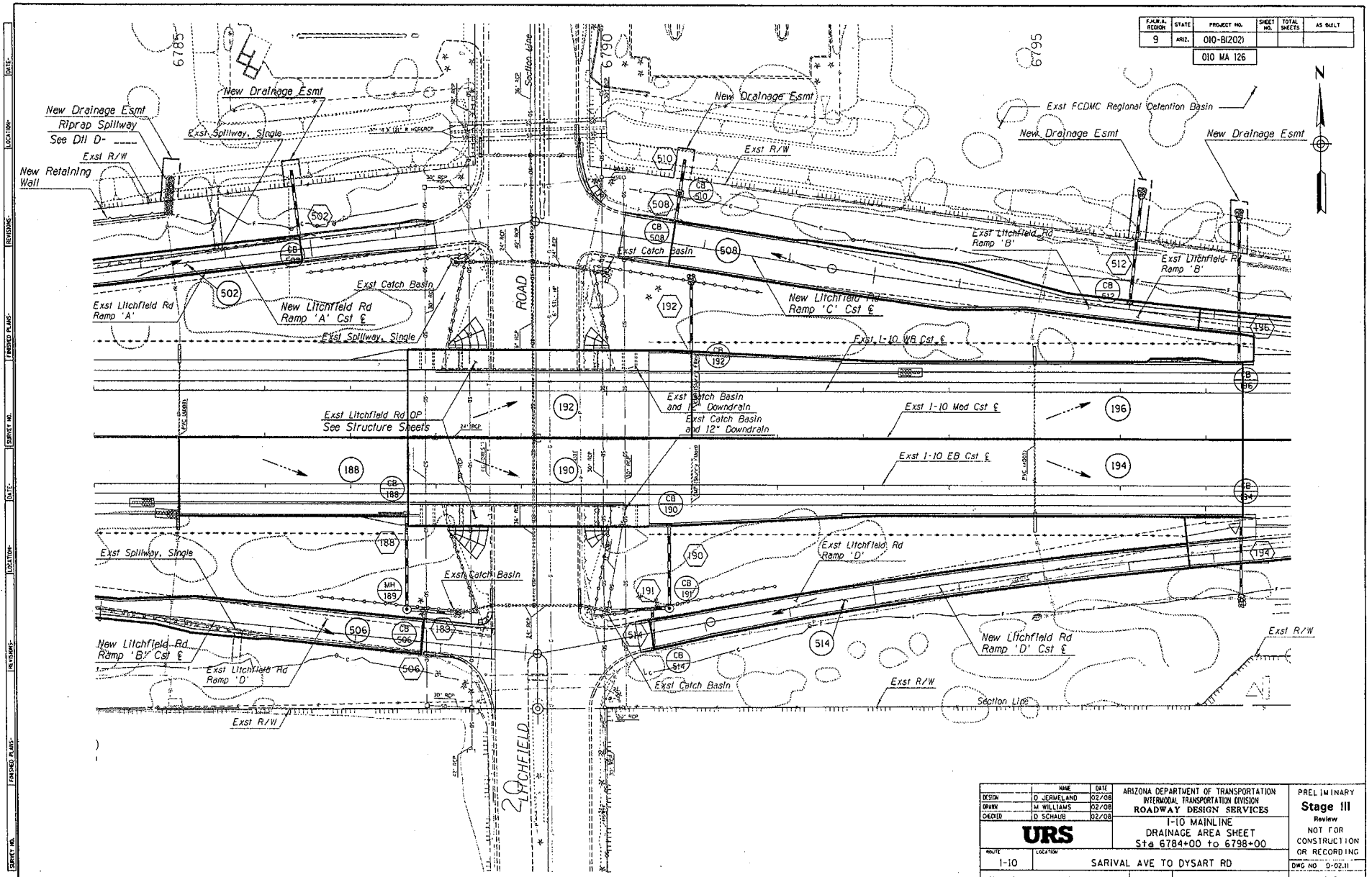

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6784+00 to 6798+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-02.11

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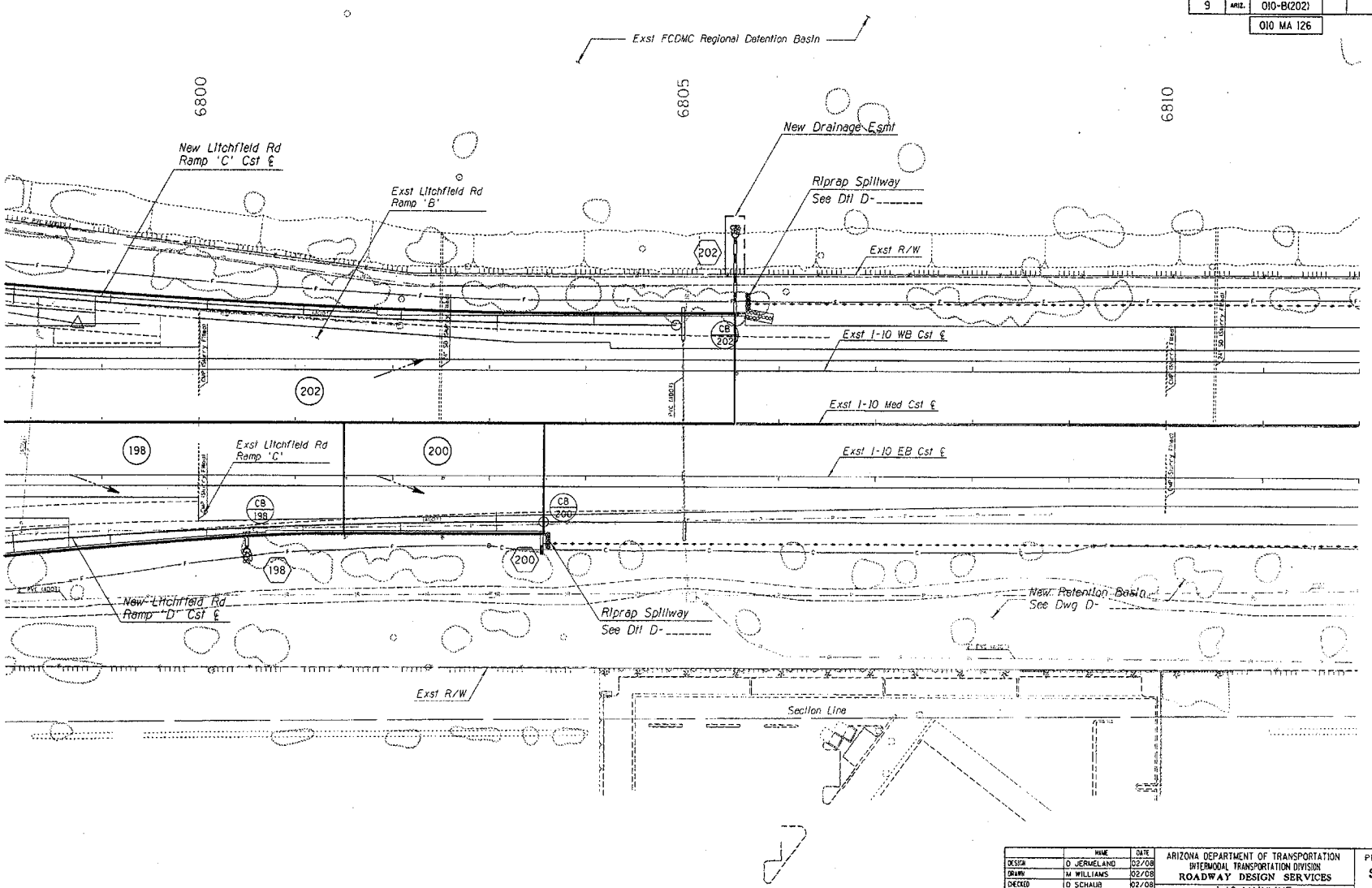

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

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	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6798+00 to 6812+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.12

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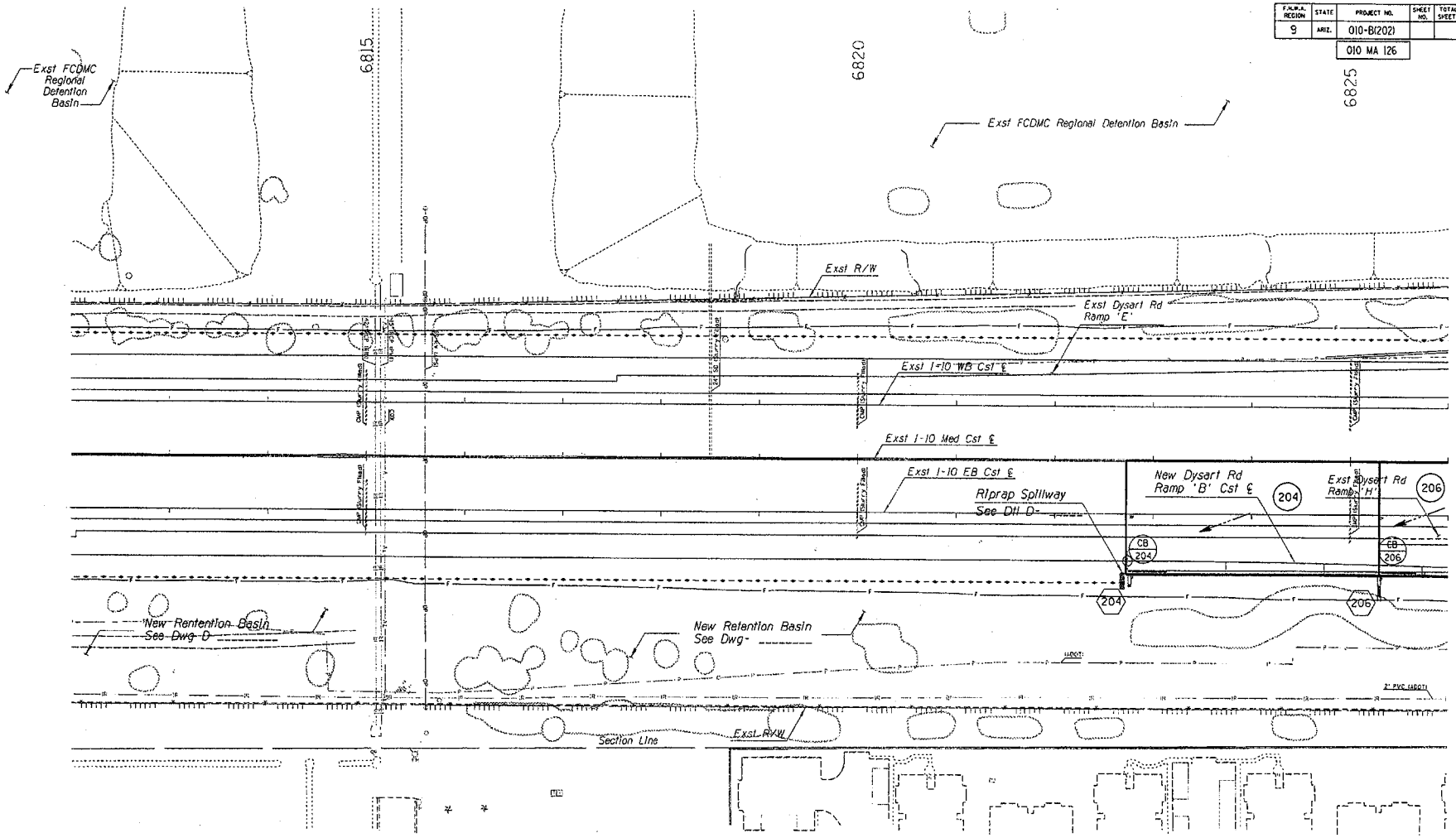

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6812+00 to 6826+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.13

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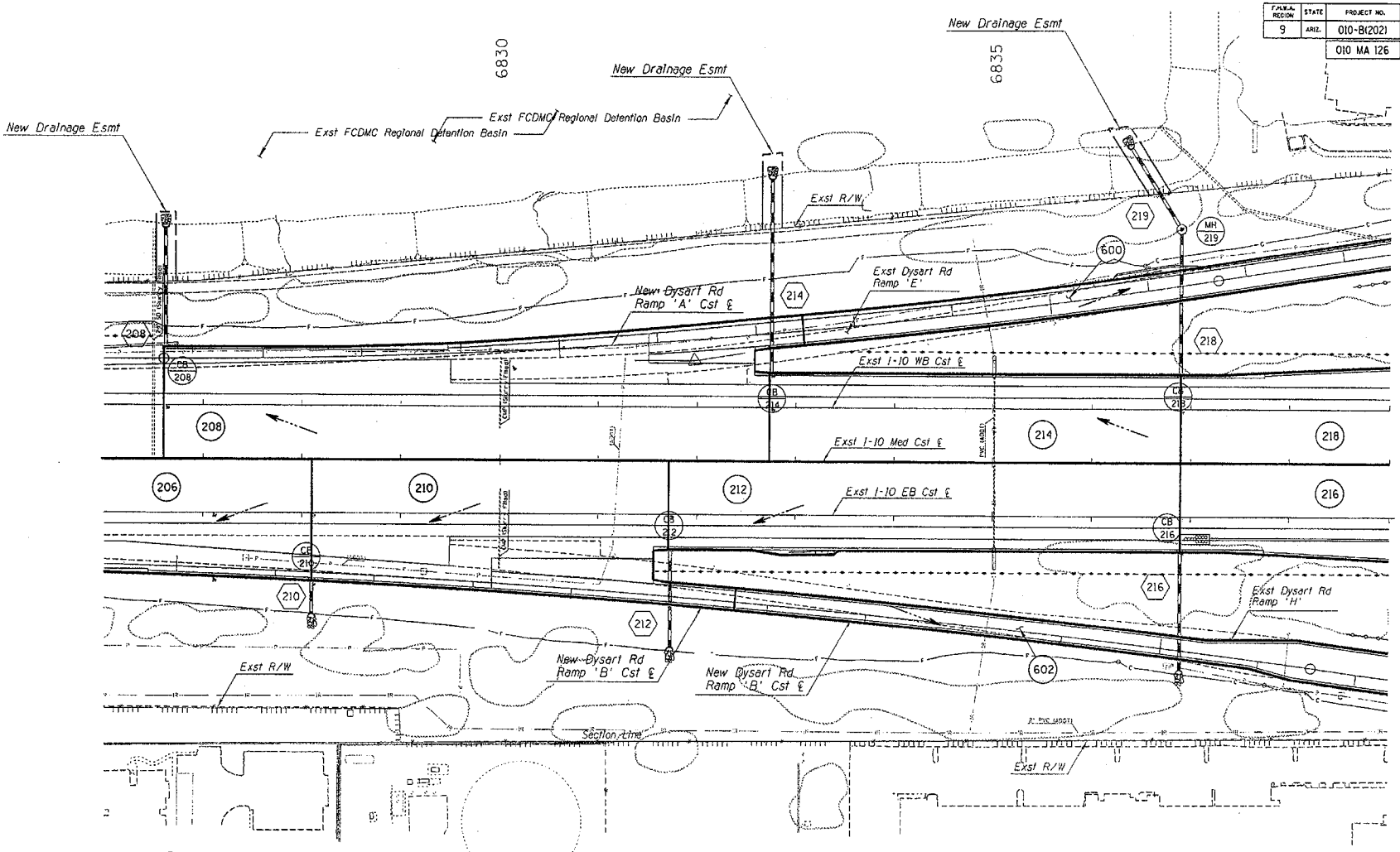

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6826+00 to 6839+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.14

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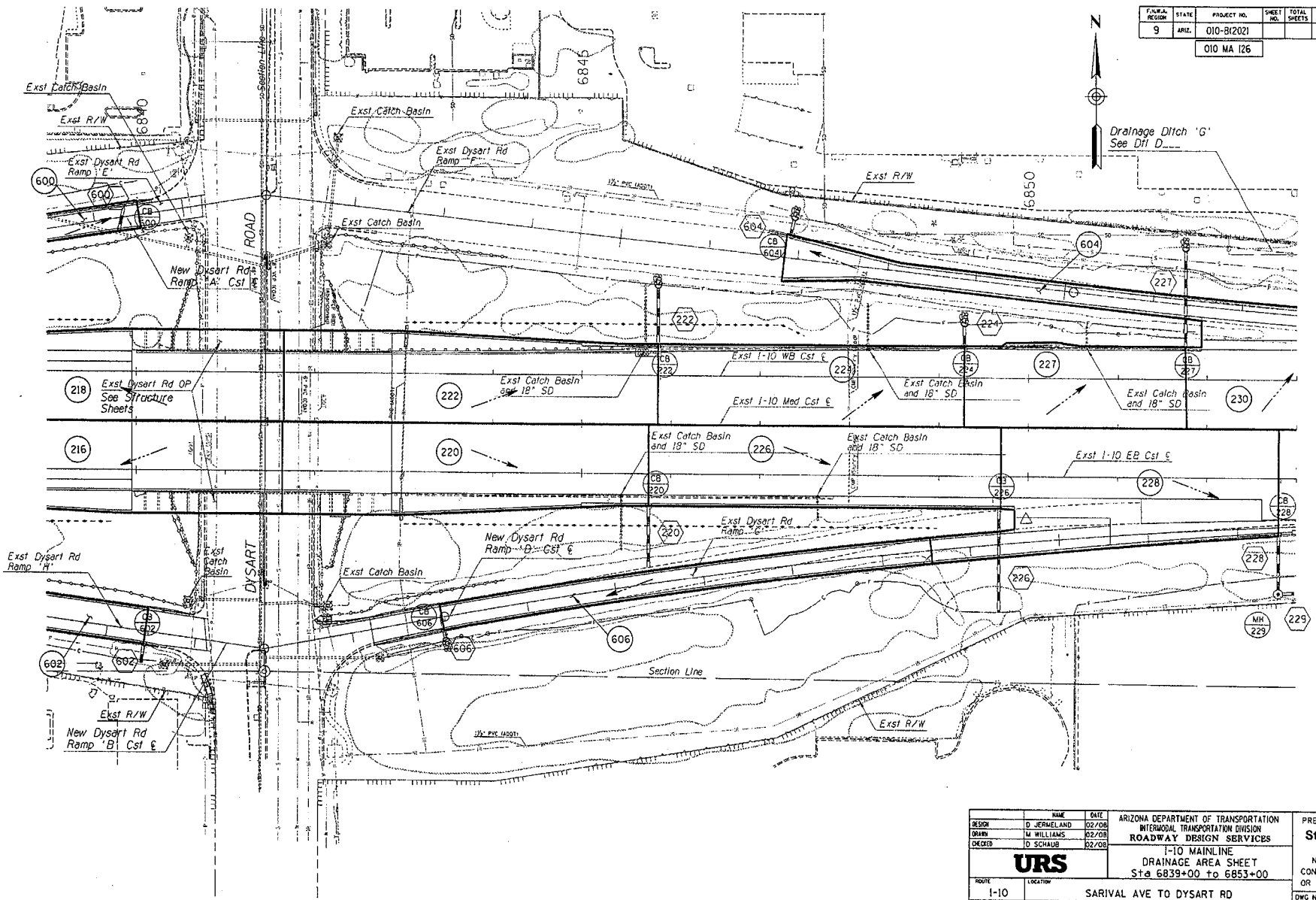

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			
		010 MA 126			

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6839+00 to 6853+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

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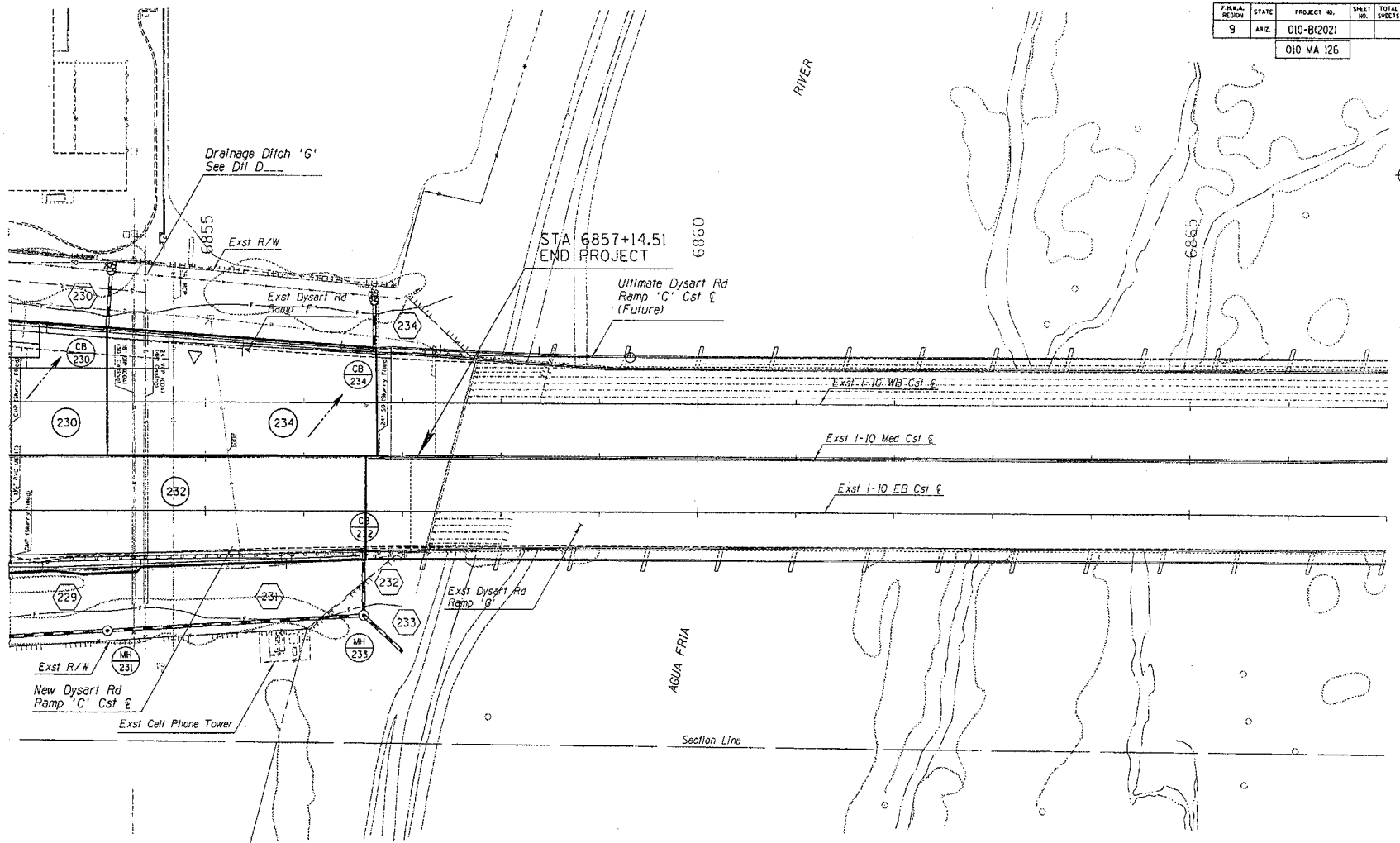

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6853+00 to 6857+14.51

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202)

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.16

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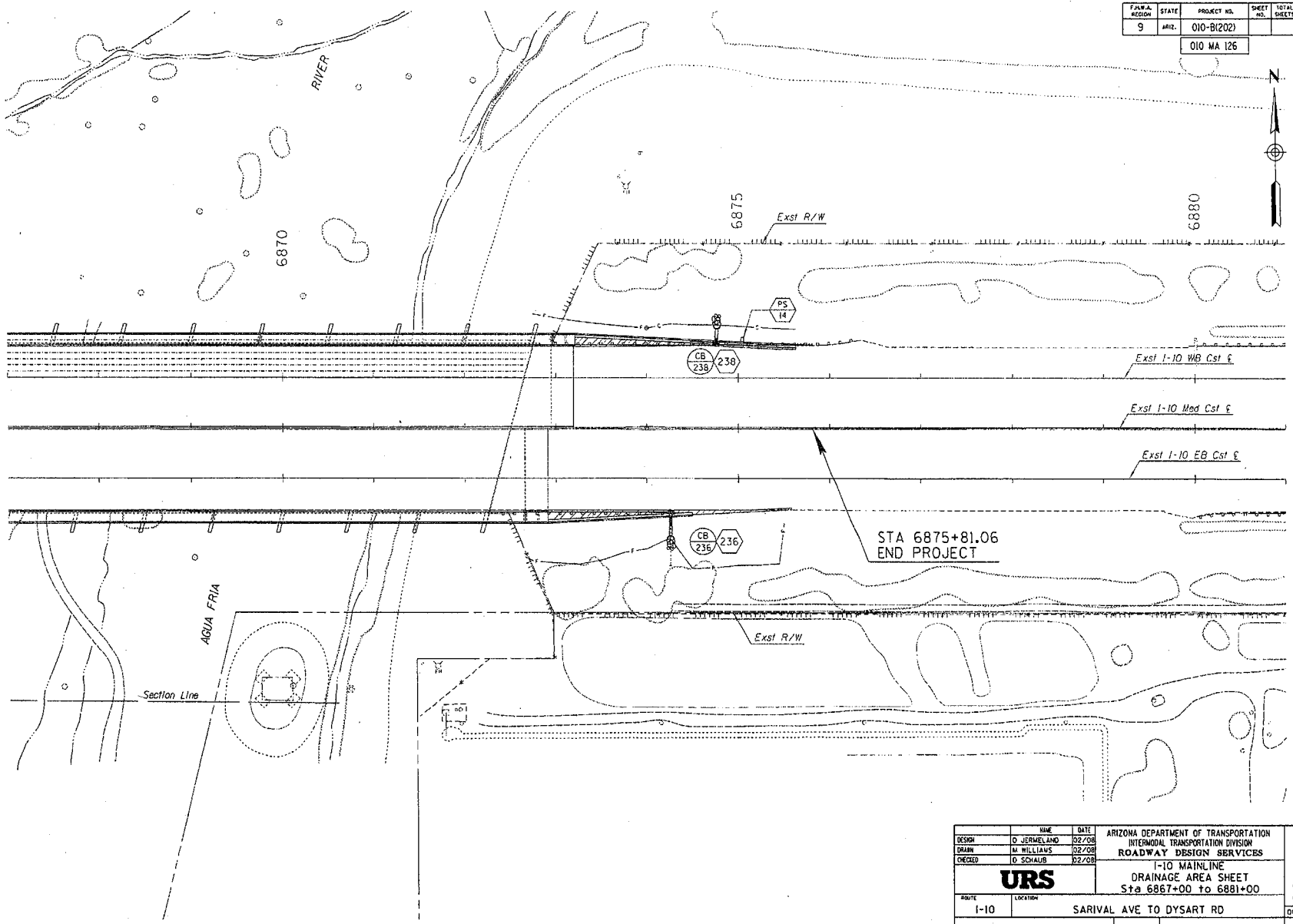

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(202)			

010 MA 126

	NAME	DATE
DESIGN	D JERMELAND	02/08
DRAWN	M WILLIAMS	02/08
CHECKED	D SCHAUB	02/08

URS

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10 MAINLINE
DRAINAGE AREA SHEET
Sta 6867+00 to 6881+00

ROUTE	LOCATION
I-10	SARIVAL AVE TO DYSART RD

TRACS NO. H7296 01C | 010-B(202) | ___ OF ___

PRELIMINARY
Stage III
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO D-02.17

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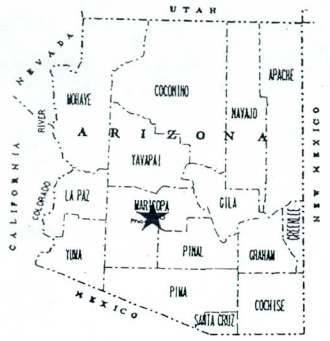
APPENDIX J

AS-BUILT/FUTURE DESIGN PLANS

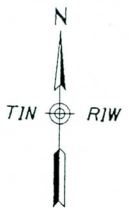


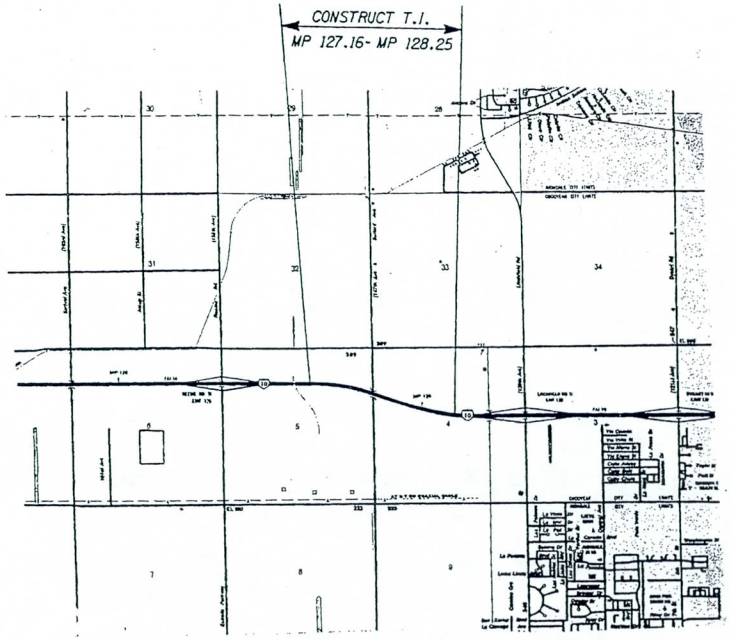
STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

PROJECT PLANS

STATE HIGHWAY
EHRENBERG–PHOENIX HIGHWAY
INTERSTATE 10

ADOT





BULLARD AVENUE T.I.

PROJECT NO. 010 MA 126 H 6780 01 C
FEDERAL AID NO. IM–010–B(007)B

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
SAM ELTERS, P.E., STATE ENGINEER

AS BUILT DATA	AS BUILT DATE	OF

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NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	11	195	

010 MA 126

Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated (In.)	Size, Smooth (In.)	Length (0) (Ft.)	Skew (0) (Degree)	Class	Class / Size	AASHTO M-294 (CHDPEPP)	End Sec C-13.20 & C-13.25 (Each)	Size, (In) Manhole	Standard or Detail	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Depth (In.)	L (0.0) (Ft.)	Pipe Exc (0)	Pipe Bk-fl (0) C-13.15	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Bullard Ave 36+17, 63.48' Rt to Bullard Ave 36+85, 44.5' Lt	1	4		24	128		III		①	1		C-15.20	S	Rt	12.0	3.5				996.50	2		320	305			CB 1 to MH 1
Bullard Ave 36+85, 53.39' Lt to Bullard Ave 36+85, 44.5' Lt	2	3		24	10		II	2	X			C-15.20	S	Lt	7.5	7.5				996.57	2		17	16			CB 2 to MH 1
Bullard Ave 36+85, 44.5' Lt to Bullard Ave 39+00, 44.5' Lt	3	4		24	212		III		①		30	C-18.10		Lt	12.6					996.74			547	522			MH 1 to MH 2
Bullard Ave 39+00, 44.5' Lt to Bullard Ave 42+23, 44.5' Lt	4	4		24	320		III		①		30	C-18.10		Lt	12.7					996.31			822	785			MH 2 to MH 3
Bullard Ave 42+23, 44.5' Lt to Bullard Ave 43+00, 11' Rt	5	5		24	92		IV				30	C-18.10		Lt	12.8					995.66			242	231			MH 3 to MH 4
Bullard Ave 44+15, 11' Rt to Bullard Ave 43+00, 11' Rt	6	3		24	112		II	2	X		30	C-18.10		Rt	8.4					996.52			187	174			MH 5 to MH 4
Bullard Ave 41+82, 48.5' Rt to Bullard Ave 41+75.50, 110' Rt	7	2		24	56		II	1	X	1		C-15.20	S	Rt	6.5	3.5				995.67	2		75	69			CB 3 to MH 6
Bullard Ave 41+75.50, 110' Rt to Bullard Ave 43+00, 110' Rt	8	4		24	120		III		X		30	C-18.10		Rt	6.2					994.85			216	202			MH 6 to MH 7
Bullard Ave 42+23, 48.5' Lt to Bullard Ave 42+23, 44.5' Lt	9	3		24	4		II	2	X			C-15.20	S	Lt	7.0	3.5				995.58	2		9	8			CB 4 to MH 3
Sheet Total										2													2435	2312			

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL	>	1	3	5	8	11	15	20	25	30	40	55	70
HEIGHT (Ft.)	≤	3	5	8	11	15	20	25	30	40	55	70	90

◓ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

◪ PIPE CORRUGATION			
A	$2\frac{2}{3}x\frac{1}{2}$	D	6x2
B	3x1	E	3x1 or $9x2\frac{1}{2}$
C	$9x2\frac{1}{2}$		

Notes:
① Max Fill Height = 10'

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc. a transportation engineering firm, 77 East Thomas Road, Suite 300, Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

PRELIMINARY 100% NOT FOR CONSTRUCTION OR RECORDING

ROUTE I-10 LOCATION I-10 / BULLARD AVENUE TI

DWG. NO. G-5.1

TRACS NO. H6780 01 C 010-B(007)B ____ OF ____

REV. DATE: 01-31-2002

ewatkins adothalf.tbl 11/10/2006 11:54:24 AM w:\transportation\adot\bullard avenue ti\cadd\civil\h6780sumpipe01.dgn

NOTE:
THE ZEROS IN PARENTHESIS (0, 0.0 & 0.00) IN THE HEADING OF SOME OF THE COLUMNS ARE THE RECOMMENDED PRECISION OF THE VALUE TO BE ENTERED IN THE COLUMN.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

NOTE:
PIPE OPTIONS SELECTED ARE THOSE REQUIRED TO MEET MINIMUM SERVICE LIFE.
SHADED PIPE OPTION FIELDS ARE NOT ALLOWABLE ALTERNATES.

NRCP - NRCIPCP - CHDPEPP

CSP - CORRUGATED STEEL PIPE
CAP - CORRUGATED ALUMINUM PIPE
RCP - REINFORCED CONCRETE PIPE
NRCP - NON-REINFORCED CONCRETE PIPE
NRCIPCP - NON-REINFORCED CAST-IN-PLACE CONCRETE PIPE
CHDPEPP - CORRUGATED HIGH DENSTIY POLYETHYLENE PLASTIC PIPE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	12	195	
		010 MA 126			

DESCRIPTION						CSP			CAP			RCP			NRCP	NRCIPCP	CHDPEPP	END TREATMENT														QUANTITIES	
				In.	In.	Ft.	Degree	In.	Coating		In.						In.		Each														
Station	Plan Ref No.	Controlling Fill Height Range	Size, Corrugated	Size, Smooth	Length (0)	Skew (0)	Corrugation	Wall Thickness (0.00)	Zinc	Bit. Coated Zinc	Aluminum	Bit. Coated Aluminum	Corrugation	Wall Thickness (0.00)	Uncoated	Bit. Coated	Class - Non Trench	Class - Trench	Class Min Wall Thickness (0)	AASHTO M-294 Type C	AASHTO M-294 Type S	C-13.20 & C-13.25 Detail - C-13.40	Size, (in) Manhole	Standard or Detail	End Sec	Ea	S-Single / D-Double	Location	H (0.0)	L Wing (0.0)	L 18" Slotted Drn (0)	L 24" Slotted Drn (0)	Type	Elev. (0.00)	Grate	Ft.	Inlet Depression	In.	Ft.	Pipe Exc (0)	Pipe Bkfl (0) C-13.15	Drn Exc (0)	Berm/Dike Emb (0)	REMARKS
Bullard Ave 43+00, 11' Rt to	10	5		36	96												IV						30	C-18.10		Rt	14.2					996.75					282	271			MH 4 to MH 7
Bullard Ave 43+00, 110' Rt																							30	C-18.10		Rt	13.9					996.00									
Bullard Ave 44+15, 66.5' Lt to	11	3		24	76												II	2			X		C-15.20	D		Lt	6.4	7.5				995.08	2				119	110			CB 5 to MH 5
Bullard Ave 44+15, 11' Rt																																									
Bullard Ave 44+15, 66.4' Rt to	12	3		24	52												II	2			X		C-15.20	D		Rt	6.5	7.5				995.09	2				83	76			CB 6 to MH 5
Bullard Ave 44+15, 11' Rt																																									
Bullard Ave 44+15, 11' Rt to	13	3		24	146												III																								
Bullard Ave 44+65, 6.6' Rt																							30	C-18.10		Rt	8.8					997.50					275	258			MH 5 to MH 8
Bullard Ave 44+65, 6.6' Rt to	14	3		24	94												III																								
Bullard Ave 46+60.50, 8' Rt																																						176	165			MH 8 to Plug (Coordinate plug with COG project)
Bullard Ave 43+00, 110' Rt to	15	5		42	16												IV																								
Bullard Ave 43+00, 128' Rt																																						65	59			MH 7 to Plug (Coordinate plug with COG project)
Sheet Total																																						1000	939			

FILL HEIGHT RANGE TABLE (Ft.)													
RANGE NO.		1	2	3	4	5	6	7	8	9	10	11	12
FILL HEIGHT (Ft.)	>	1	3	5	8	11	15	20	25	30	40	55	70
	≤	3	5	8	11	15	20	25	30	40	55	70	90

◒ SHOULD FIELD CONDITIONS VARY FROM THE RANGE INDICATED, CONTACT DESIGN FOR RE-EVALUATION OF PIPE DESIGN REQUIREMENTS.

PIPE CORRUGATION			
A	2⅔x½	D	6x2
B	3x1	E	3x1 or 9x2½
C	9x2½		

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 300
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NEW PIPE SUMMARY SHEET

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B | DWG. NO. G-5.2 | ___ OF ___

REV. DATE: 01-31-2002

SURVEY NO. | FINISHED PLANS | REVISIONS | DATE | SURVEY NO. | FINISHED PLANS | REVISIONS | DATE | LOCATION | FINISHED PLANS | REVISIONS | DATE | LOCATION

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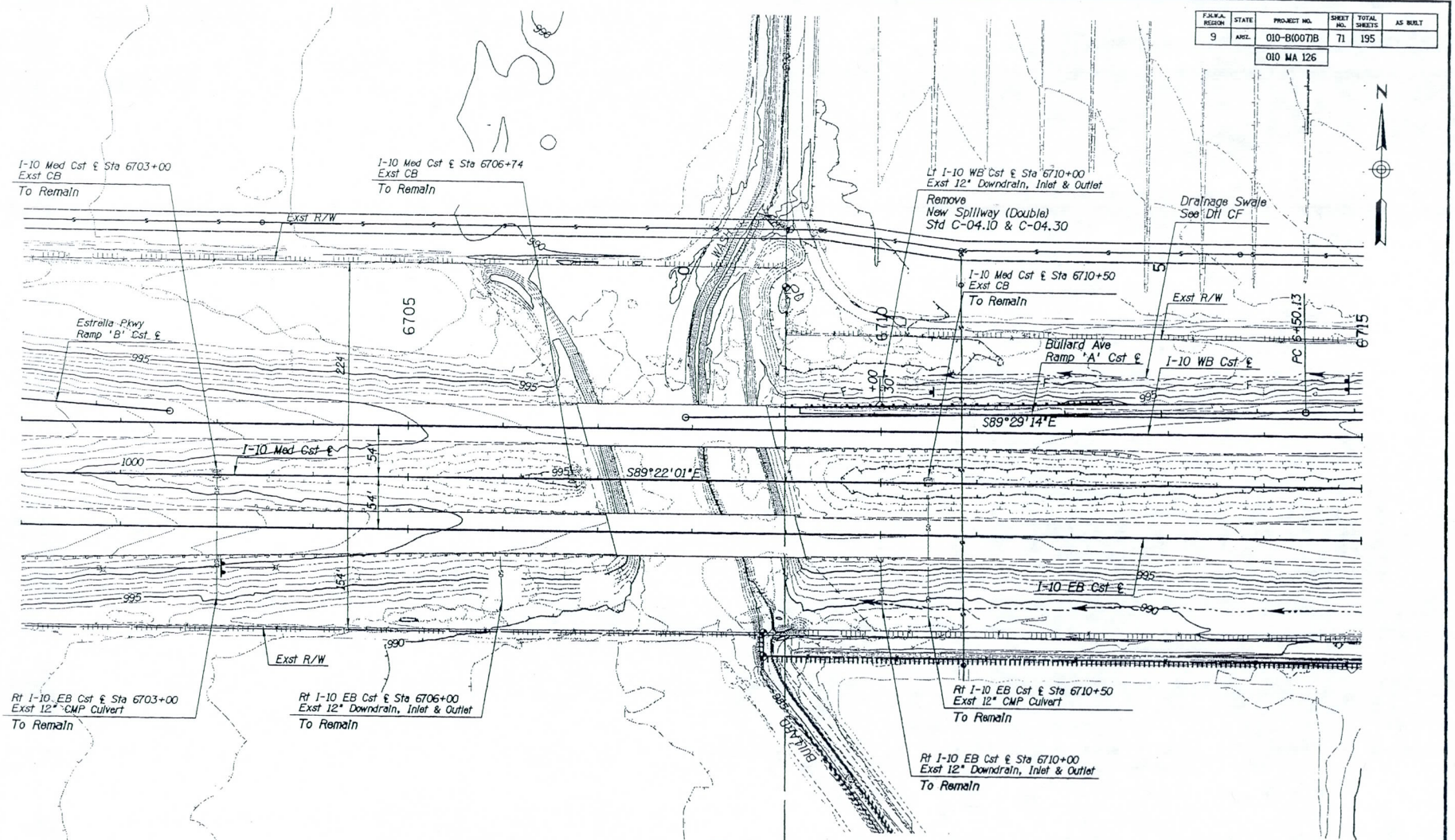

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	71	195	
		010 MA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 300
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10
DRAINAGE PLAN
STA 6701+00 TO STA 6715+00

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-11

___ OF ___

FINISHED PLANS | SURVEY NO. | DATE | LOCATION | REVISIONS | DATE

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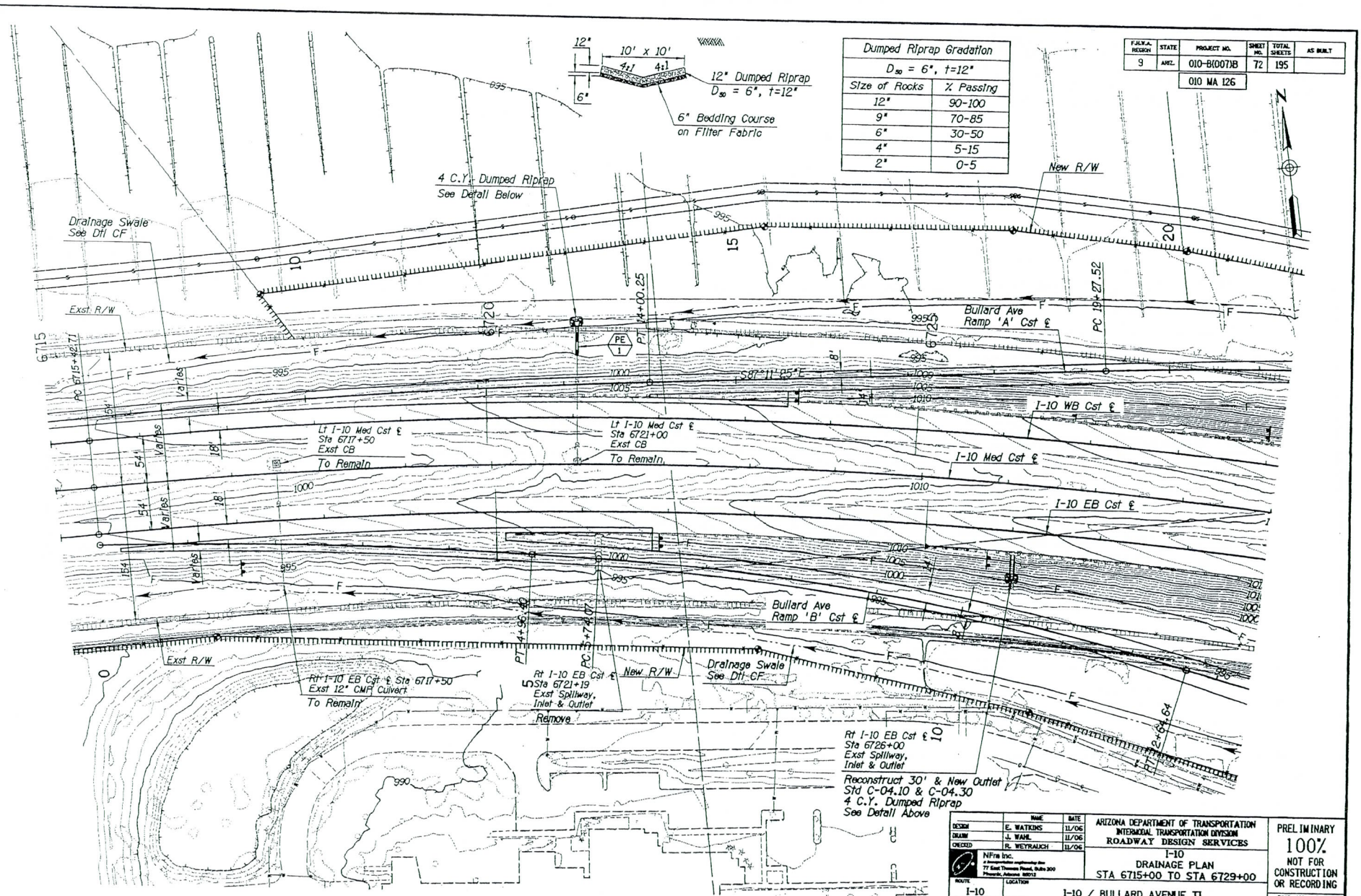

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	72	195	
		010 MA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 300
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10
DRAINAGE PLAN
STA 6715+00 TO STA 6729+00

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-12
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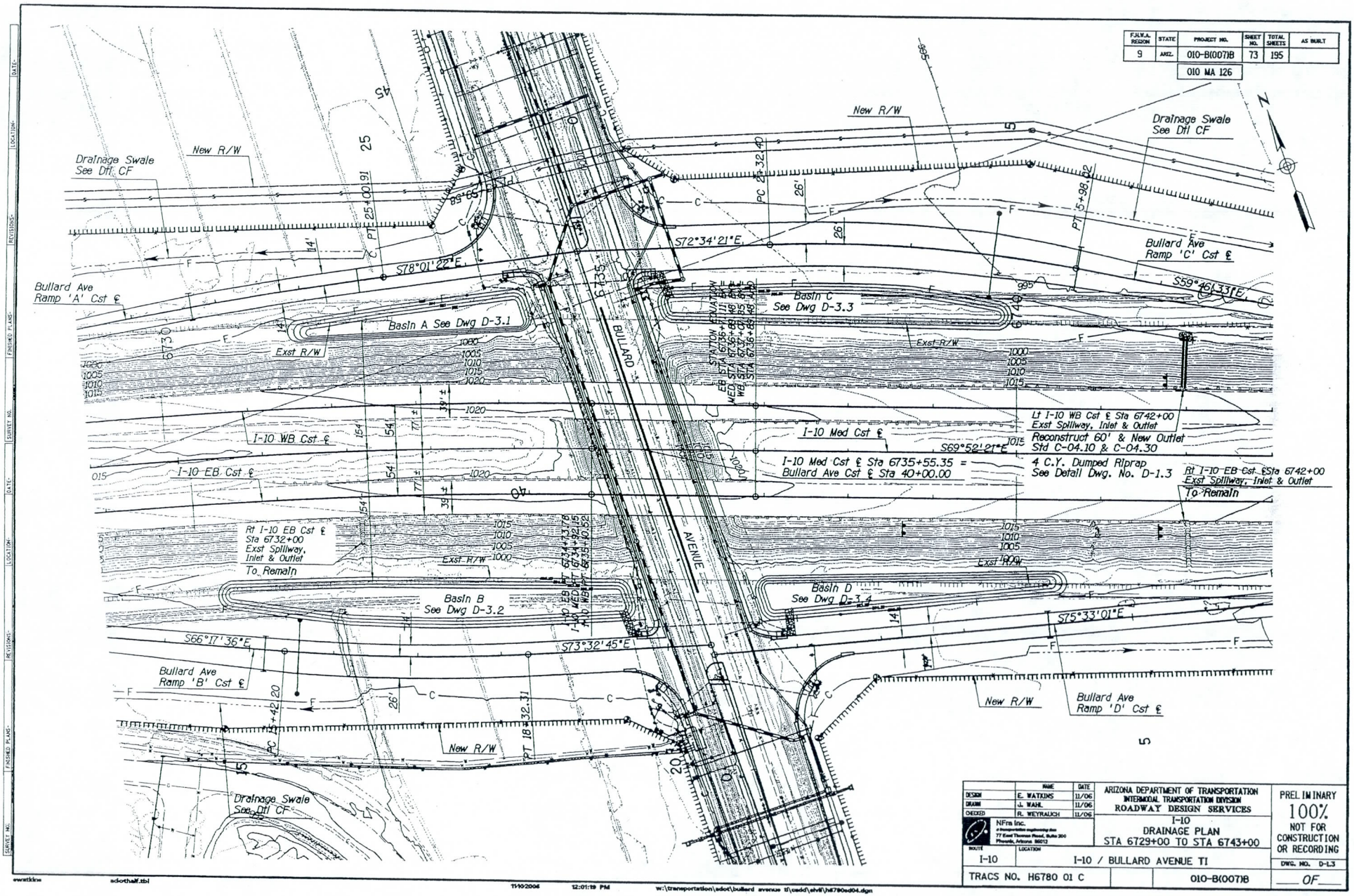

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	73	195	
		010 MA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10
DRAINAGE PLAN
STA 6729+00 TO STA 6743+00

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B | DWG. NO. D-1.3 | ___ OF ___

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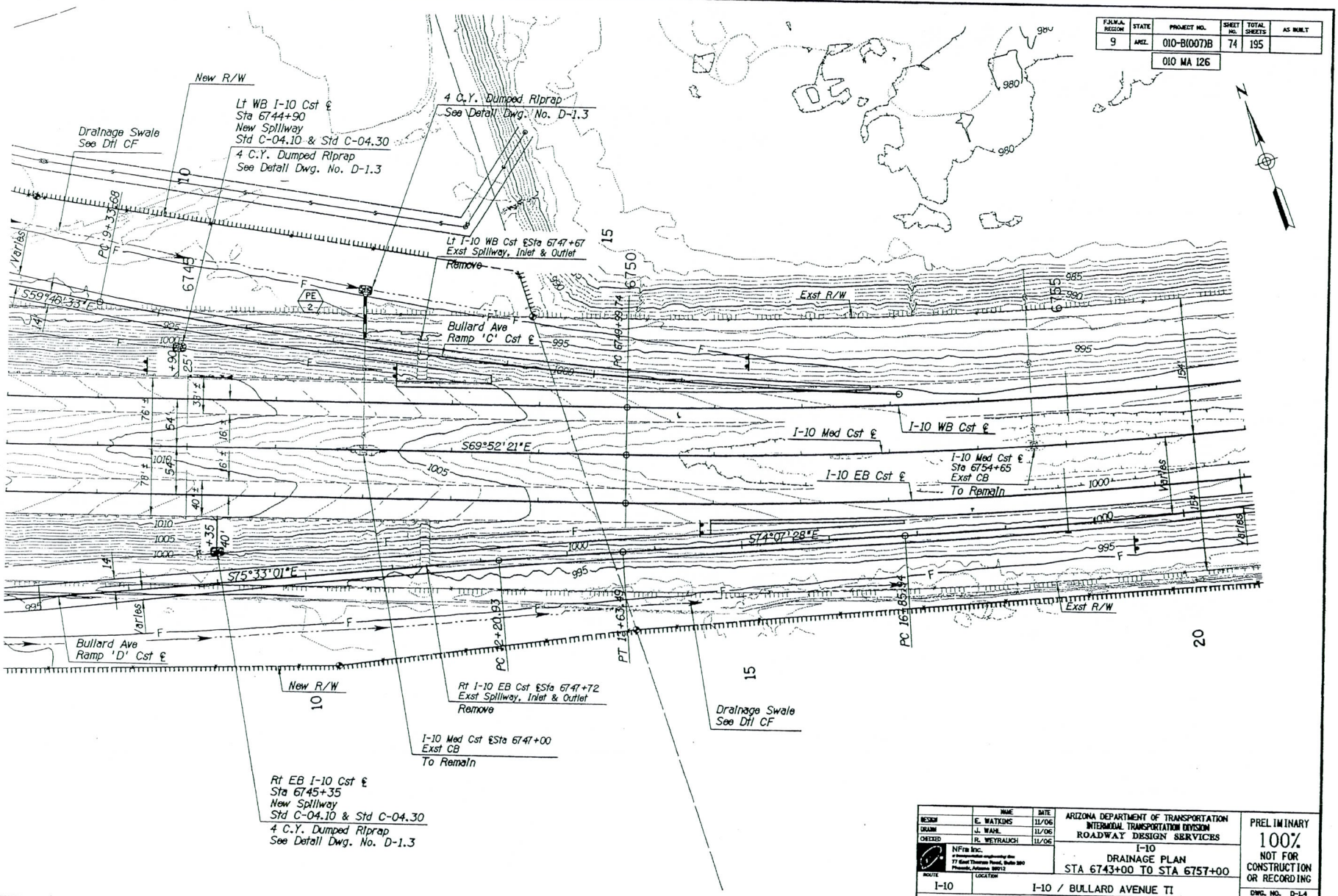

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	74	195	

010 MA 126

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10
DRAINAGE PLAN
STA 6743+00 TO STA 6757+00

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.4

___ OF ___

SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE | SURVEY NO. | LOCATION | DATE | FINISHED PLANS | REVISIONS | LOCATION | DATE

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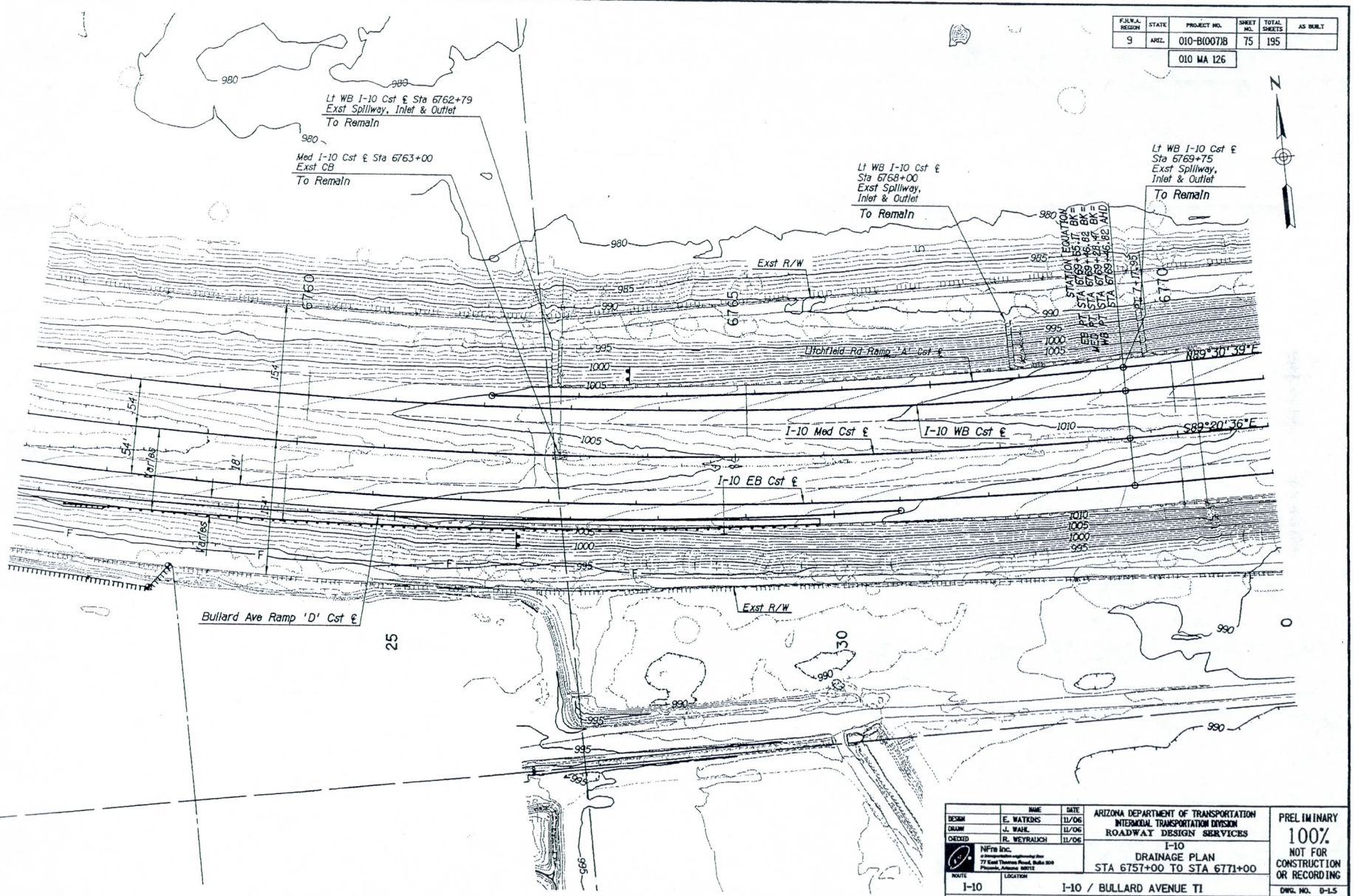

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	75	195	
		010 MA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFre Inc.
77 East Thomas Road, Suite 304
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

I-10
DRAINAGE PLAN
STA 6757+00 TO STA 6771+00

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.5

ROUTE	LOCATION	
I-10	I-10 / BULLARD AVENUE TI	
TRACS NO. H6780 01 C		010-B(007)B

___ OF ___

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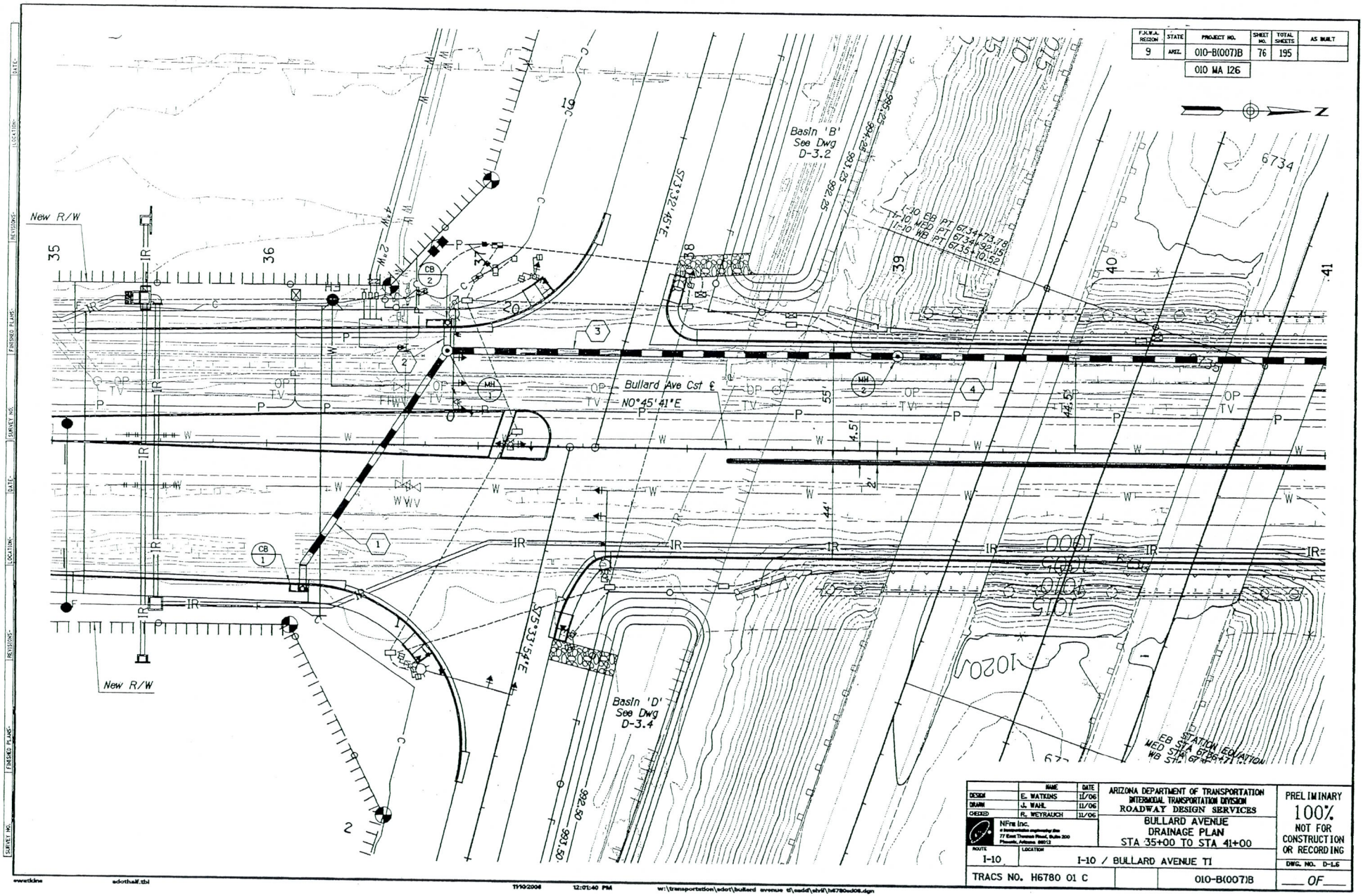

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	76	195	
		010 MA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFire Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

BULLARD AVENUE
DRAINAGE PLAN
STA 35+00 TO STA 41+00

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG. NO. D-L6
I-10	I-10 / BULLARD AVENUE TI	
TRACS NO. H6780 01 C		010-B(007)B

OF

SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE | SURVEY NO. | FINISHED PLANS | REVISIONS | DATE

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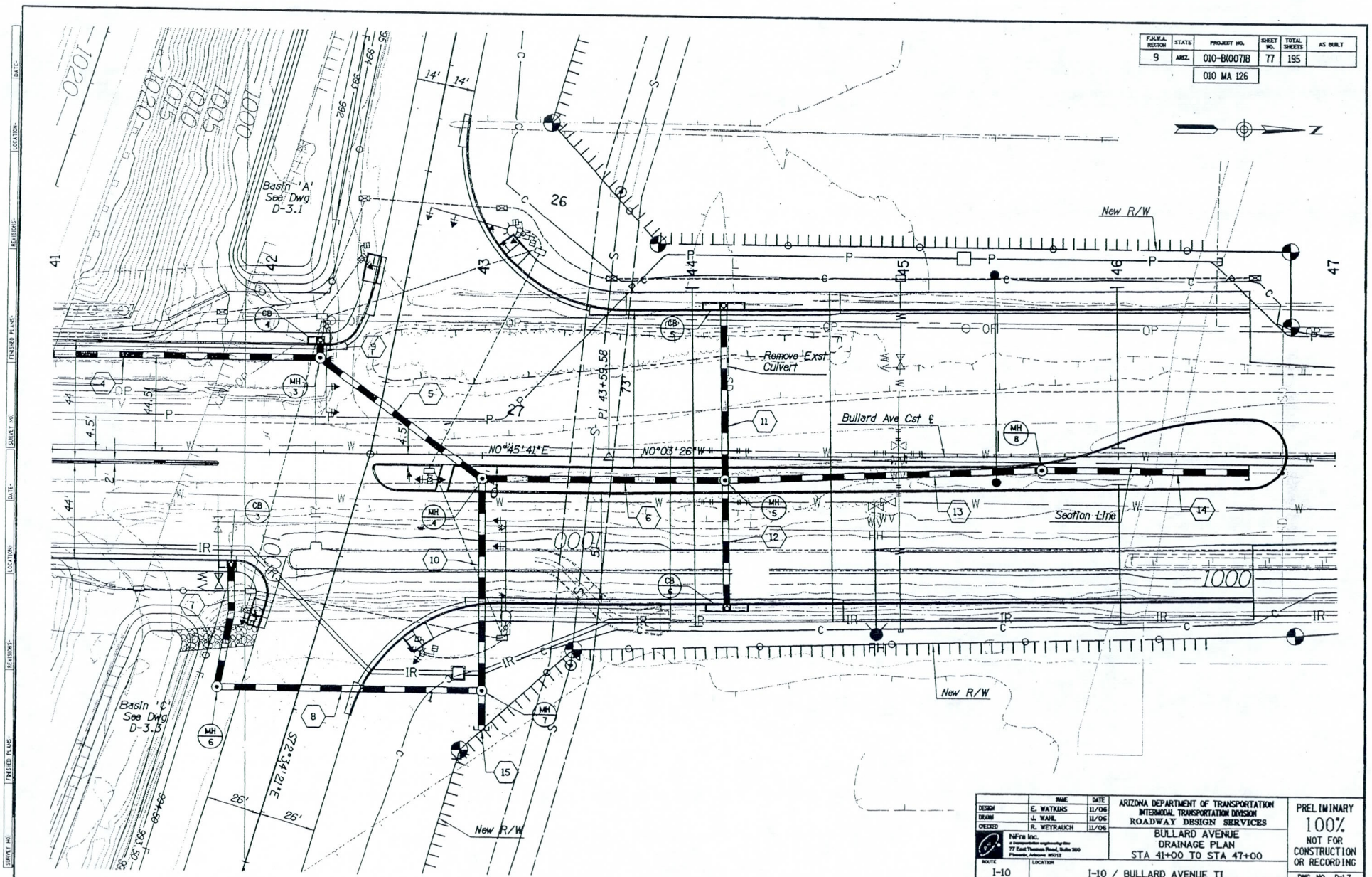

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	77	195	
		010 WA 126			

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

BULLARD AVENUE
DRAINAGE PLAN
STA 41+00 TO STA 47+00

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.7

OF

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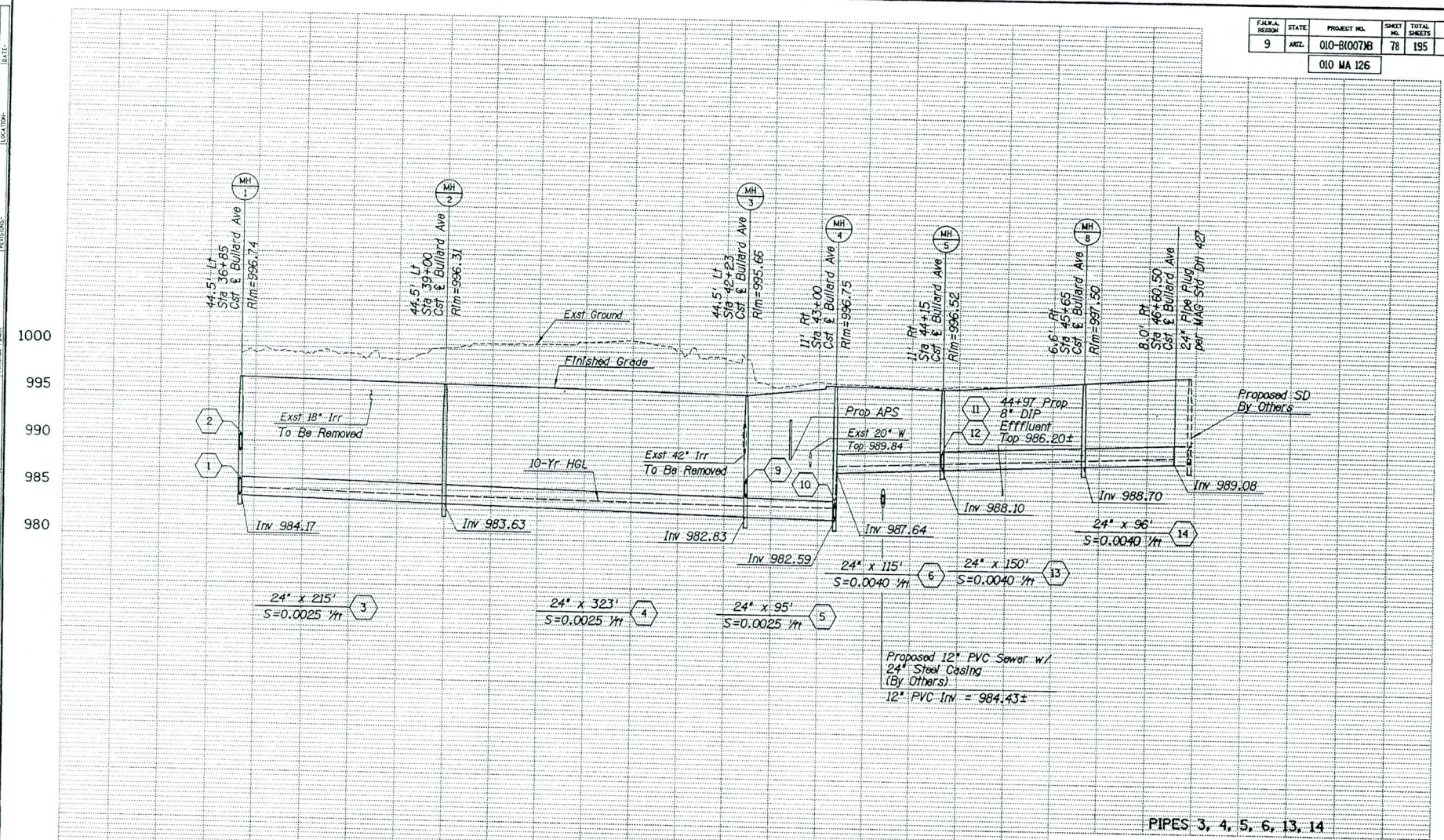
F.A.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	78	195	

010 MA 126



PIPES 3, 4, 5, 6, 13, 14

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

BULLARD AVENUE
STORM DRAIN PROFILES

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

DWG. NO. D-2.1

___ OF ___

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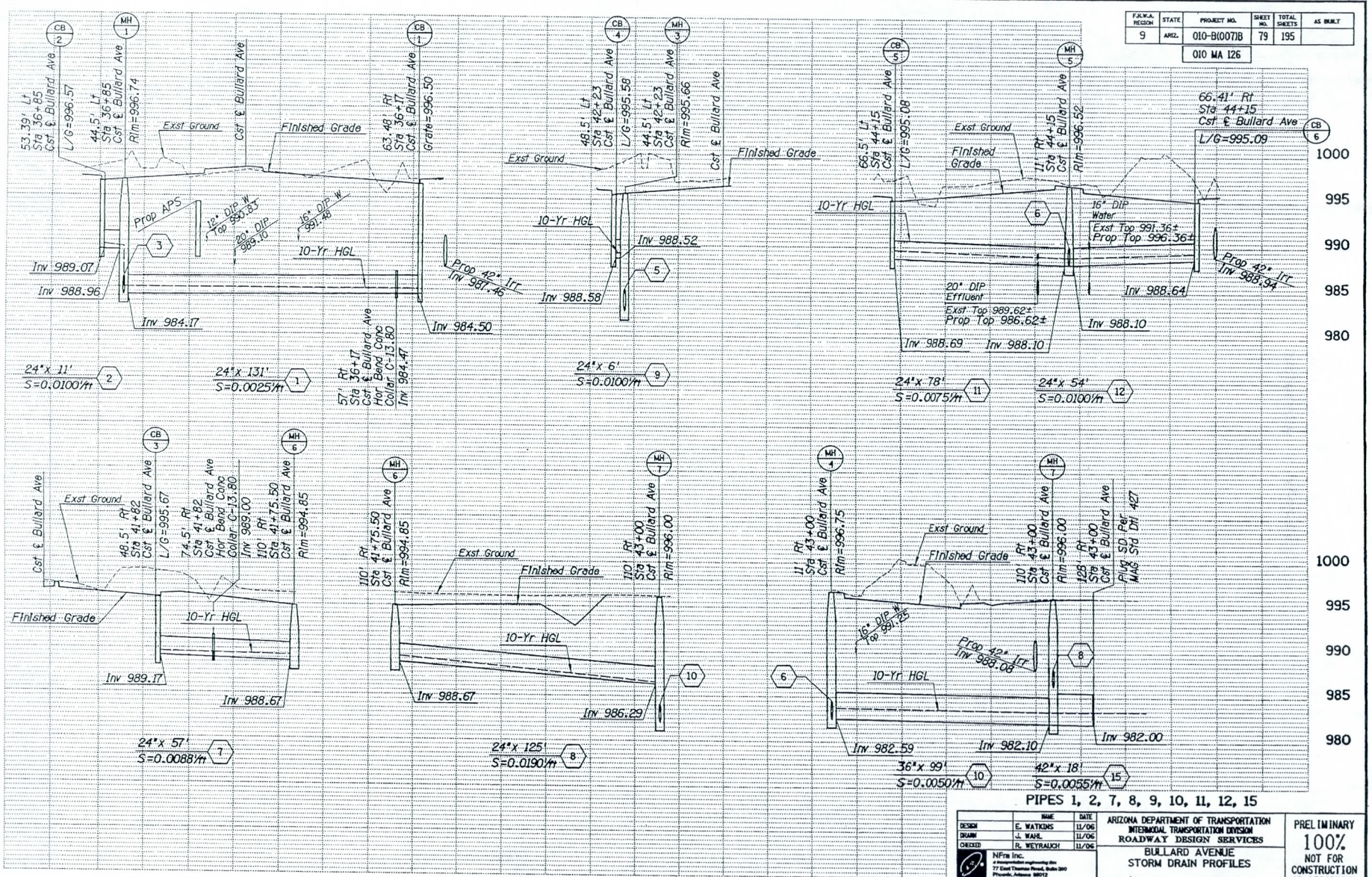
F.A.H.U.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	79	195	
		010 MA 126			



PIPES 1, 2, 7, 8, 9, 10, 11, 12, 15

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

BULLARD AVENUE
STORM DRAIN PROFILES

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	
I-10	I-10 / BULLARD AVENUE TI	
TRACS NO. H6780 01 C		010-B(007)B

DWG. NO. D-2.2
___ OF ___

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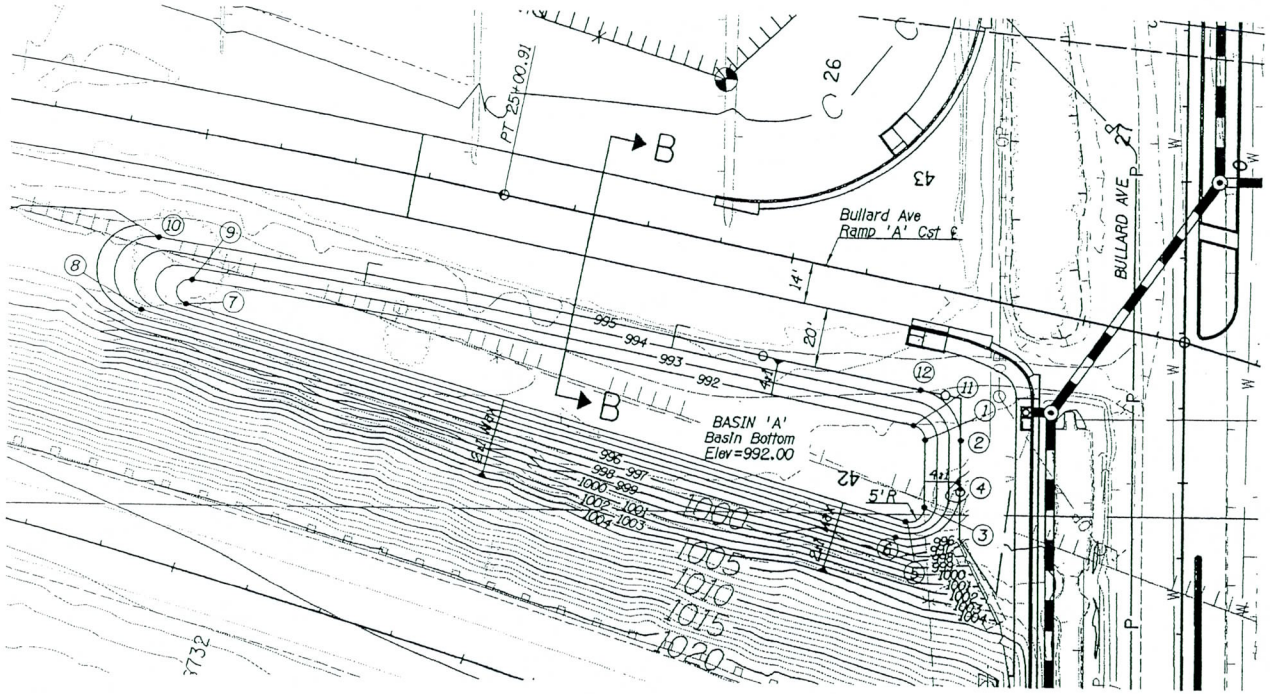
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	80	195	

010 MA 126

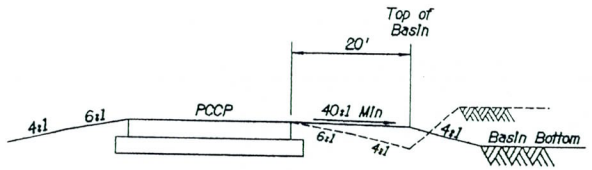


N

Notes:

1. *Basin shall be scarified and remain uncompacted to a depth of 1' after construction is complete to increase percolation rates.*

COORDINATE TABLE					
PT #	STATION	OFFSET	NORTHING	EASTING	ELEVATION
1	26+55.90	50.03' Rt	895656.34	560125.68	992.00
2	26+67.67	47.69' Rt	895656.18	560137.68	995.00
3	26+56.57	69.00' Rt	895633.90	560125.38	992.00
4	26+67.46	60.98' Rt	895639.98	560137.47	995.00
5	26+51.03	74.74' Rt	895629.17	560118.95	992.00
6	26+48.60	80.49' Rt	895623.92	560115.59	995.00
7	24+04.01	56.53' Rt	895701.01	559878.89	992.00
8	23+89.91	61.11' Rt	895699.09	559864.38	995.00
9	24+04.40	48.06' Rt	895709.27	559880.86	992.00
10	23+91.16	36.18' Rt	895723.37	559870.17	995.00
11	26+51.00	46.00' Rt	895661.30	560121.72	992.00
12	26+51.00	34.00' Rt	895673.04	560124.21	995.00



SECTION B-B
(Typ All Basins)

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

RETENTION BASIN 'A'
GEOMETRIC DATA

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG. NO. D-3.1
I-10	I-10 / BULLARD AVENUE TI	
TRACS NO. H6780 01 C		010-B(007)B

___ OF ___

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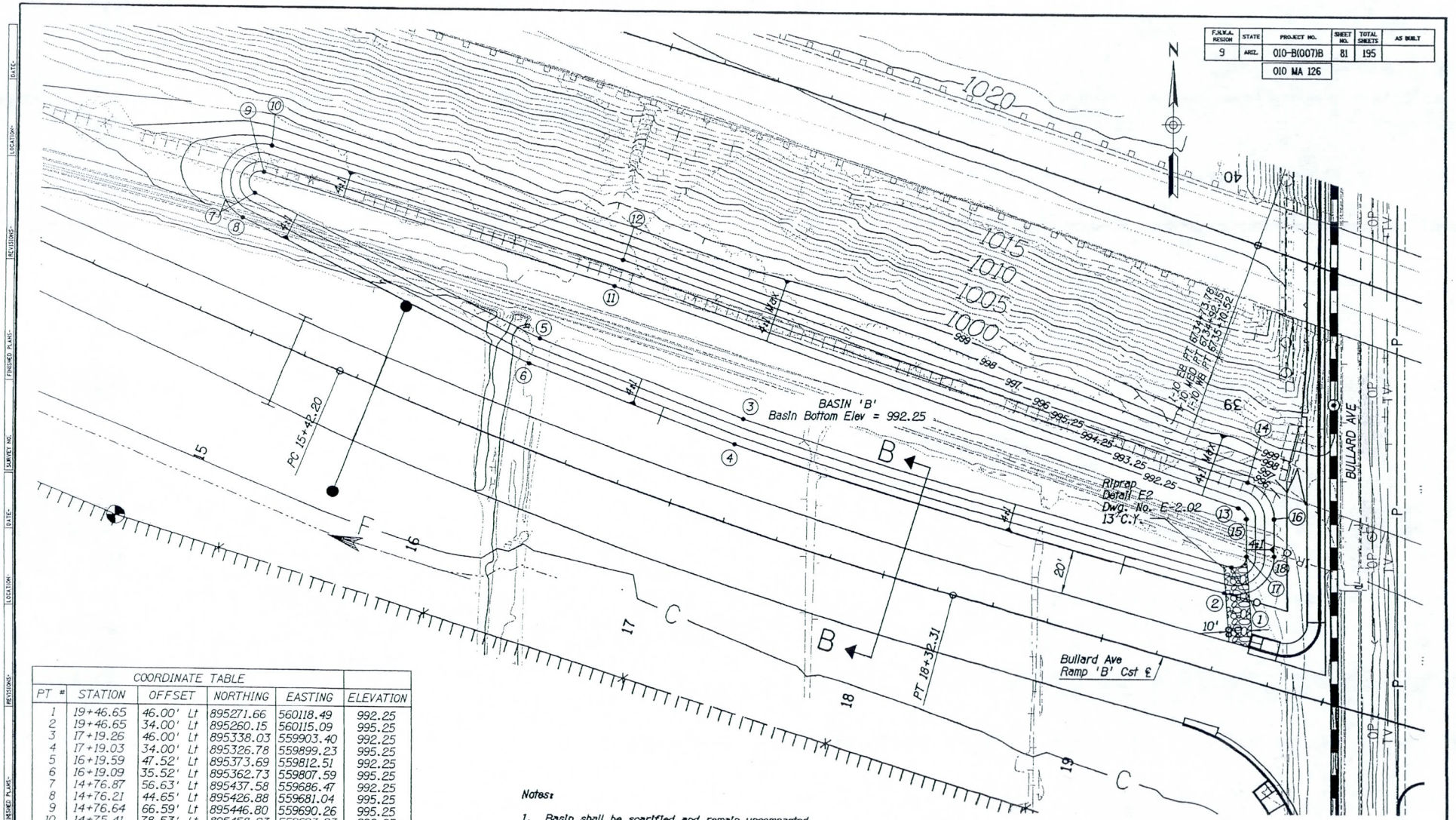
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	81	195	
		010 MA 126			



COORDINATE TABLE					
PT #	STATION	OFFSET	NORTHING	EASTING	ELEVATION
1	19+46.65	46.00' Lt	895271.66	560118.49	992.25
2	19+46.65	34.00' Lt	895260.15	560115.09	995.25
3	17+19.26	46.00' Lt	895338.03	559903.40	992.25
4	17+19.03	34.00' Lt	895326.78	559899.23	995.25
5	16+19.59	47.52' Lt	895373.69	559812.51	992.25
6	16+19.09	35.52' Lt	895362.73	559807.59	995.25
7	14+76.87	56.63' Lt	895437.58	559686.47	992.25
8	14+76.21	44.65' Lt	895426.88	559681.04	995.25
9	14+76.64	66.59' Lt	895446.80	559690.26	995.25
10	14+75.41	78.53' Lt	895458.23	559693.93	992.25
11	16+43.41	81.20' Lt	895396.56	559846.37	992.25
12	16+42.89	93.20' Lt	895407.92	559850.25	995.25
13	19+42.57	71.56' Lt	895297.34	560121.82	992.25
14	19+43.27	83.54' Lt	895308.62	560125.88	995.25
15	19+47.09	67.93' Lt	895292.56	560125.12	992.25
16	19+58.64	71.17' Lt	895292.41	560137.12	995.25
17	19+51.47	52.35' Lt	895277.39	560124.91	992.25
18	19+63.02	55.60' Lt	895276.23	560136.90	995.25

Notes:

1. Basin shall be scarified and remain uncompacted to a depth of 1' after construction is complete to increase percolation rates.
2. See Section B-B Dwg No D-3.1

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

RETENTION BASIN 'B'
GEOMETRIC DATA

ROUTE	LOCATION
I-10	I-10 / BULLARD AVENUE TI

TRACS NO. H6780 01 C | 010-B(007)B

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-3.2
___ OF ___

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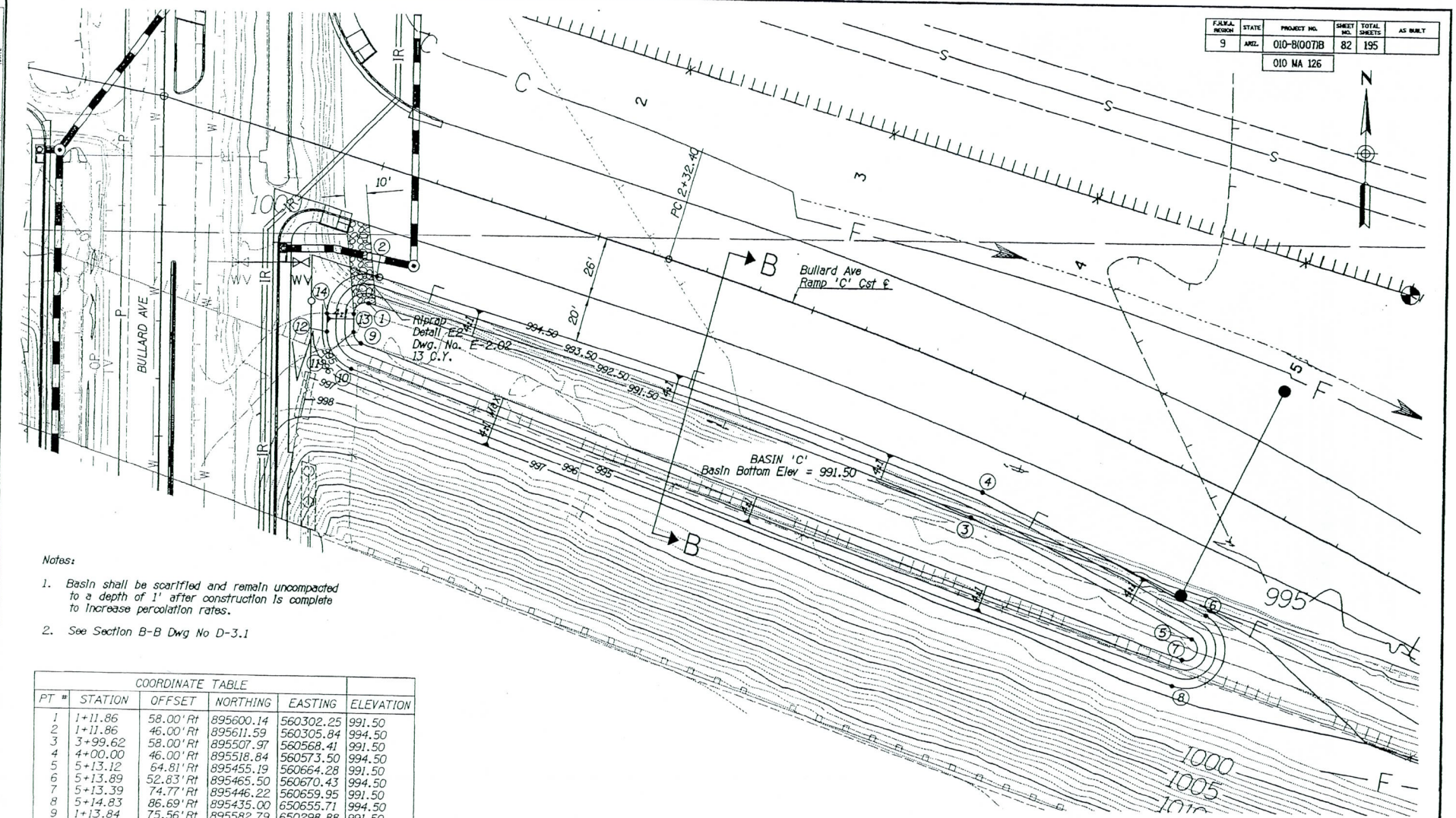

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	82	195	
		010 MA 126			

Notes:

1. *Basin shall be scarified and remain uncompacted to a depth of 1' after construction is complete to increase percolation rates.*
2. *See Section B-B Dwg No D-3.1*

COORDINATE TABLE					
PT #	STATION	OFFSET	NORTHING	EASTING	ELEVATION
1	1+11.86	58.00'Rt	895600.14	560302.25	991.50
2	1+11.86	46.00'Rt	895611.59	560305.84	994.50
3	3+99.62	58.00'Rt	895507.97	560568.41	991.50
4	4+00.00	46.00'Rt	895518.84	560573.50	994.50
5	5+13.12	64.81'Rt	895455.19	560664.28	991.50
6	5+13.89	52.83'Rt	895465.50	560670.43	994.50
7	5+13.39	74.77'Rt	895446.22	560659.95	991.50
8	5+14.83	86.69'Rt	895435.00	650655.71	994.50
9	1+13.84	75.56'Rt	895582.79	650298.88	991.50
10	1+13.15	87.54'Rt	895571.57	650294.63	994.50
11	1+09.34	72.01'Rt	895587.54	650295.65	991.50
12	0+97.84	75.45'Rt	895587.70	650283.65	994.50
13	1+07.07	64.43'Rt	895595.44	650295.75	991.50
14	0+95.57	67.88'Rt	895595.60	650283.75	994.50

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

RETENTION BASIN 'C'
GEOMETRIC DATA

PRELIMINARY
100%
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	DWG. NO.
I-10	I-10 / BULLARD AVENUE TI	D-3.3
TRACS NO. H6780 01 C	010-B(007)B	___ OF ___

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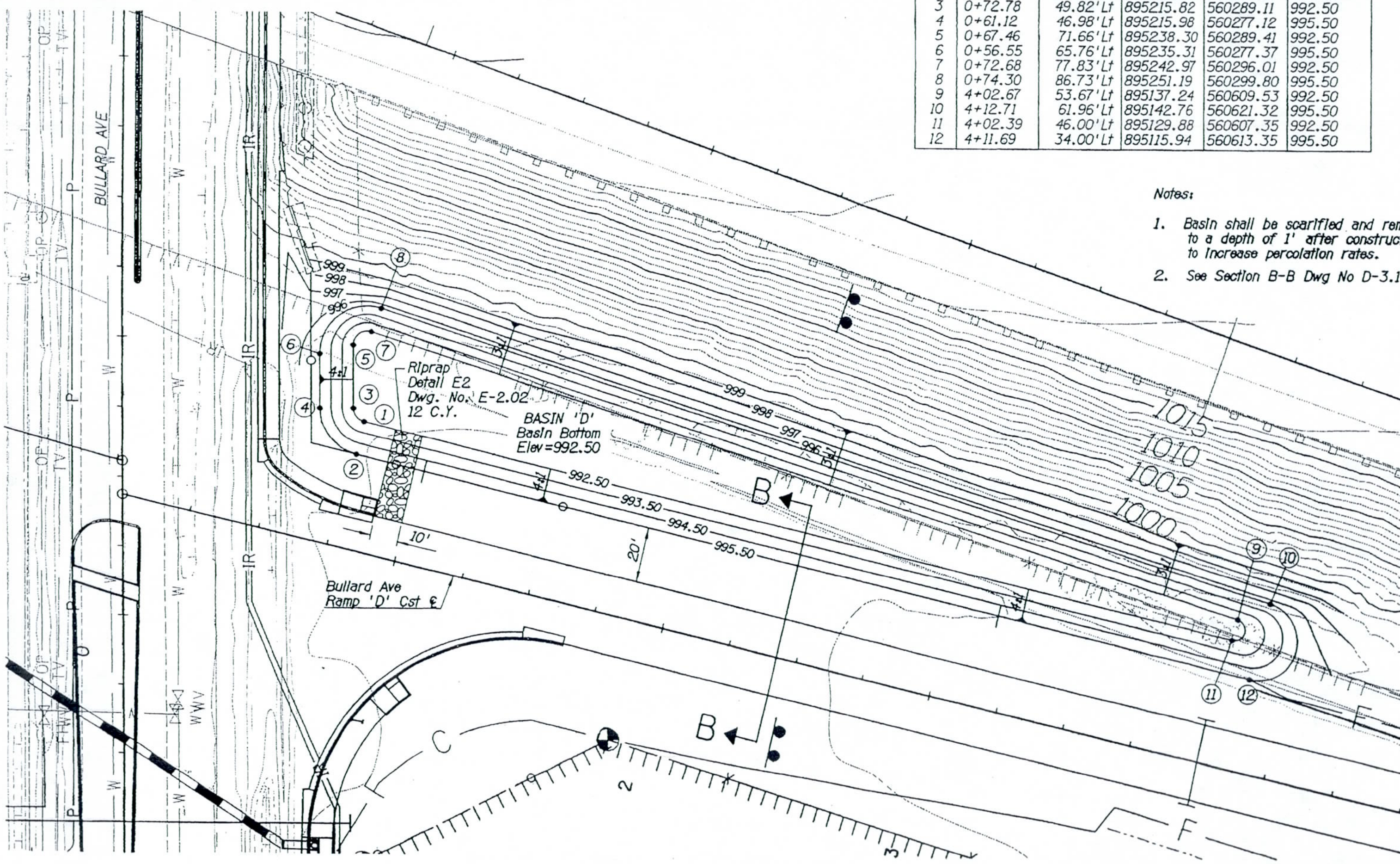
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-B(007)B	83	195	

010 MA 126

COORDINATE TABLE					
PT #	STATION	OFFSET	NORTHING	EASTING	ELEVATION
1	0+77.64	46.00'Lt	895210.92	560292.87	992.50
2	0+77.64	34.00'Lt	895199.30	560289.87	995.50
3	0+72.78	49.82'Lt	895215.82	560289.11	992.50
4	0+61.12	46.98'Lt	895215.98	560277.12	995.50
5	0+67.46	71.66'Lt	895238.30	560289.41	992.50
6	0+56.55	65.76'Lt	895235.31	560277.37	995.50
7	0+72.68	77.83'Lt	895242.97	560296.01	992.50
8	0+74.30	86.73'Lt	895251.19	560299.80	995.50
9	4+02.67	53.67'Lt	895137.24	560609.53	992.50
10	4+12.71	61.96'Lt	895142.76	560621.32	995.50
11	4+02.39	46.00'Lt	895129.88	560607.35	992.50
12	4+11.69	34.00'Lt	895115.94	560613.35	995.50



Notes:

1. *Basin shall be scarified and remain uncompacted to a depth of 1' after construction is complete to increase percolation rates.*
2. *See Section B-B Dwg No D-3.1*

	NAME	DATE
DESIGN	E. WATKINS	11/06
DRAWN	J. WAHL	11/06
CHECKED	R. WEYRAUCH	11/06

NFra Inc.
A transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

RETENTION BASIN 'D'
GEOMETRIC DATA

PRELIMINARY
100%
NOT FOR
CONSTRUCTION
OR RECORDING

ROUTE: I-10
LOCATION: I-10 / BULLARD AVENUE TI

DWG. NO. D-3.4

TRACS NO. H6780 01 C | 010-B(007)B | ___ OF ___

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TRIAL VERSION of TIFFDLL

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CONSTRUCTION PLANS
FOR

AGUA FRIA RIVER CHANNEL IMPROVEMENTS

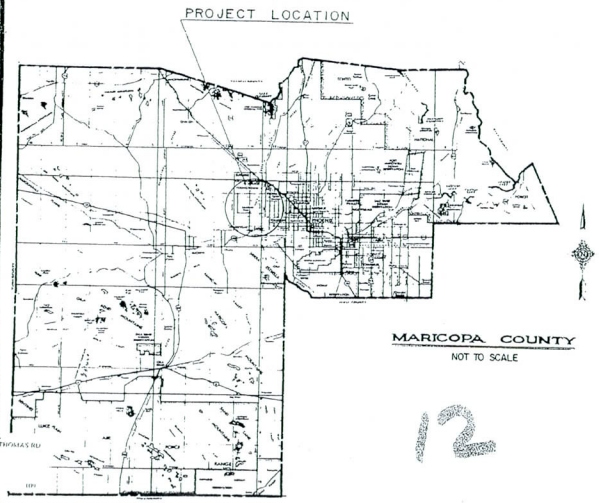
I-10 FREEWAY TO THOMAS ROAD

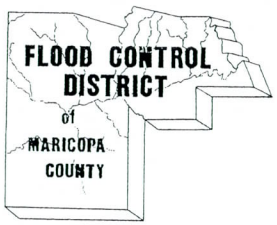
STA. 92+51.96 TO 117+19.86 (SIMONS, LI & ASSOCIATES)

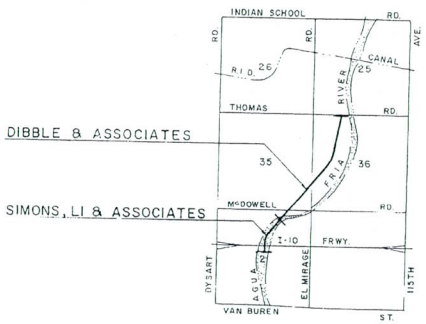
STA. 117+19.86 TO 189+70.09 (DIBBLE & ASSOCIATES)

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	COVER
2	QUANTITY, SUMMARY & GENERAL NOTES
3-4	OVERALL PLAN
5-8	TYPICAL SECTIONS
9	DETAILS
10-16	PLAN
17-20	PROFILE
21-43	CROSS SECTIONS







VICINITY MAP

"AS-BUILT DRAWING"

I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

D. E. SAGRAMOSO, P.E.
CHIEF ENGINEER AND GENERAL MANAGER

FLOOD CONTROL DISTRICT of Maricopa County
3335 W. DURANGO STREET - PHOENIX, ARIZONA 85009 - TEL. (602) 262-1501

SIMONS, LI & ASSOCIATES
DIBBLE & ASSOCIATES

COVER SHEET

RECOMMENDED BY: Nick Kramer 7-8-85

APPROVED BY: Stewart Smith A. DATE 7-8-85
CHIEF ENGINEER & GENERAL MANAGER
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SHEET: 1 OF 43

F.C.D. CONTRACT NO. 85-16

12

TRIAL VERSION of TIFFDLL

QUANTITIES

FILL (C.Y.) (N.P.I.) * *

Sta. 92+51.96 to 117+19.86 (See X-Sections)	64,660
Sta. 147+00 to 181+00 (See X-Sections)	101,956
Mandatory Offsite Area (See Sheet 11)	99,210
Total	265,826
AS-BUILT	

EXCAVATION (C.Y.)

Sta. 93+17.96 to 117+19.86	257,465
Sta. 117+19.86 to 189+70.09, INCLD. C.O. #9	660,~~400~~ 427 PER ADD #1 (7-25-85)
I-10 Diversion Channel	153,480
McDowell Rd. to I-10 Diversion Channel	11,800
LOW FLOW CHANNEL EXCAVATION INCLD. C.O. #8	
Use 1,083,200 / Total	1,083,~~400~~ 172
AS-BUILT	1,152,751

EMBANKMENT (C.Y.)

Sta. 93+17.96 to 117+19.86	70,959
Sta. 117+19.86 to 189+70.09	151,~~500~~ 430 PER ADD #1 (7-25-85)
I-10 Diversion Channel	214,630
McDowell Rd. to I-10 Diversion Channel	2,100
Use 439,200 / Total	439,~~300~~ 113
AS-BUILT	378,197

SOIL CEMENT (C.Y.)

Sta. 93+17.96 to 117+19.86	~~40,700~~ 41,135 PER ADD #1 (7-25-85)
Sta. 117+19.86 to 189+70.09	112,~~700~~ 275
I-10 Diversion Channel	8,700
Shelf at I-10 Bridge	11,500
Tower Protection	29,000
Grade Control Structures	65,250
Use 267,~~800~~ 900 / Total	267,~~440~~ 860
AS-BUILT	267,885

CEMENT (TONS)

Sta. 93+17.96 to 117+19.86	~~9,200~~ 9,385 PER ADD #1 (7-25-85)
Sta. 117+19.86 to 189+70.09	25,615
I-10 Diversion Channel	2,025
Shelf at I-10 Bridge	3,030
Tower Protection	7,634
Grade Control Structures	17,180
Use 64,~~800~~ 900 / Total	64,~~700~~ 869
AS-BUILT	66,755

FLY ASH (TONS)
ADDED PER C.O. #8 — AS-BUILT 5,788

* * No direct payment will be made for fill material within the the Agua Fria River channel, spoil areas, or the mandatory offsite area along the west levee at McDowell Road, as indicated on the plans and cross sections. The cost of this fill material is being considered as incidental and included in the cost of channel excavation.

DUMPED RIPRAP (C.Y.)

I-10 Bridge	1,050
Tower Protection	4,480
Total	5530
AS-BUILT	4,778

GRAVEL FILTER BLANKET (C.Y.)

130
127 AS-BUILT

GEOTEXTILE FILTER FABRIC (S.Y.)

1000
754 AS-BUILT

DRIVING PILES (L.S.)

4 Required (AS-BUILT)

~~SHOTCRETE (S.Y.) (MAG Spec 535.3)~~

~~400~~ DELETED PER C.O. #7

~~REINFORCING STEEL (LB.) (MAG Spec 727)~~

~~5000~~ DELETED PER C.O. #7

REMOVE & RESET FENCE, SIGNS, & BASES (L.S.)

Along North Side of I-10

INSTALL PIPE & HEADWALL (L.S.)

STA. 97+00±, WEST FLOWLINE
ADDED PER C.O. #5

GENERAL NOTES

1. The Mix Design Requirements for Soil Cement Bank Protection Shall be Such That it has a Compressive Strength of 750psi at the End of Seven (7) Days, Plus an Additional 2% Cement Added to the Design Mix for Erosion/Abrasion Resistance.*
2. The Contractor Shall Incorporate the In situ Soil Aggregate from the Project Site into the Soil Cement Mixture.

Optimum Soil Aggregate Gradation

Sieve Size	Percent Passing (Dry Weight)
1-1/2"	98-100
No. 4	60-~~90~~ C.O. #5
No. 200	5-15

3. Water Shall be Clear and Free from Injurious Amounts of Oil, Acid Alkali, Organic Matter, or other Deleterious Substances.
4. Portland Cement Shall be Type II Low Alkali and Comply with the Latest Specifications for Portland Cement (ASTM C150, CSA A-5, or AASHTO M85). Fly Ash May be Used at the Option of the Contractor. A Maximum of Fifteen (15) Percent of the Total Weight of Cement May be Replaced with Fly Ash, in Accordance with the Requirements Noted in the Contract Special Provisions.
5. Datum - B.C. in H.H. at McDowell Rd. N ½, Section 2; Elev. 982.12'
6. The Contractor Shall Keep Suitable Equipment on Hand at the Job Site for Maintaining Dust Control and Shall Control Dust as Directed by the Engineer. The Use of Gravity Flow Spray Bars and Splash Plates Will Not Be Permitted.
7. Disposal of Waste Material (Broken Concrete, Organic Material, Etc.) Shall be the Responsibility of the Contractor.
8. A Permit Issued by M.C.H.D. Shall be Required for All Work in the County Right of Way.
9. All Work to Conform to the MAG Uniform Standard Specifications for Public Works Construction Dated 1979 and Current Revisions Thereto.
10. Standard Details Refer to the MAG Standard Details for Public Works Construction Unless Otherwise Noted.
11. All Existing Utility Lines Shown on Plans are from Available Utility Records. Contractor Shall Verify the Actual Field Location Before Starting Construction.
12. Utilities Interfering with Construction Shall be Reset or Relocated by the Utility Company Concerned.
13. All Stationing is Construction ℄ Stationing Unless Otherwise Noted.
14. All Callout Distances Lt. and Rt. are from Construction ℄ Unless Otherwise Noted.
15. All Trees, Bushes, and Fences Inside the R/W Which Interfere with Construction will be Removed Unless Otherwise Noted. No Burning Will Be Permitted.
16. The Contractor will Obtain any Necessary Permits from the Local Government and Utilities for Work Within Their Jurisdictions and Easements.

* See Special Provisions for Strength Requirements for Grade Control Structures and Tower Protection.

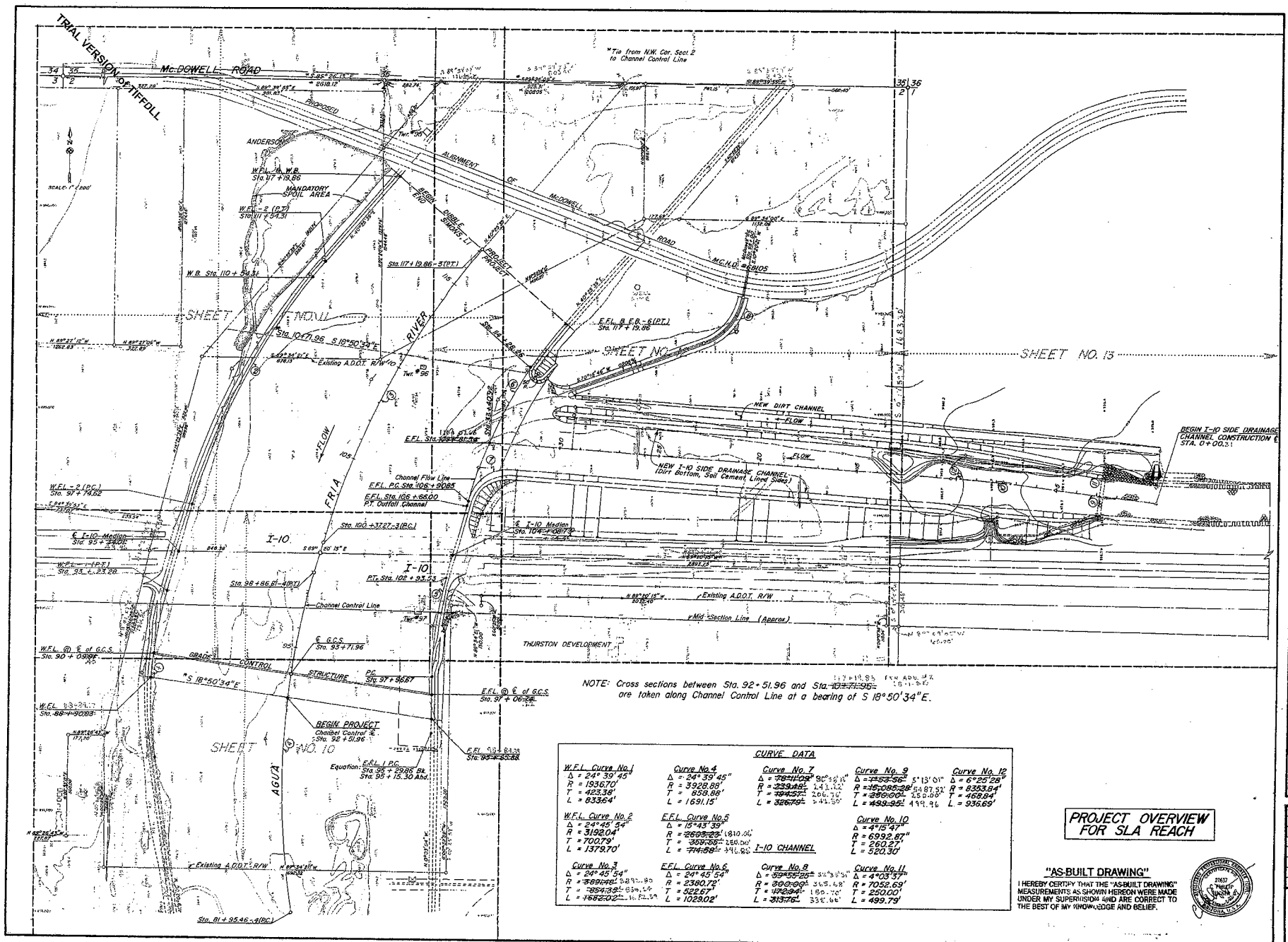
"AS-BUILT DRAWING"
I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

FLOOD CONTROL DISTRICT of MARICOPA CO.
3335 West Durango Street • Phoenix Arizona 85009 • Tel. 602-262-1501

Drawn By: SGK	AGUA FRIA RIVER CHANNEL IMPROVEMENTS
Designed By: KEA	I-10 FREEWAY TO THOMAS ROAD
Checked By: KMD	
Date: 5/3/85	Recommended By / Approved By (Chief Engineer and General Manager)

DIBBLE & ASSOCIATES
Consulting Engineers
3625 N. 16th Street • Phoenix Arizona 85016 • Tel. 602-264-6149

SHEET 2 OF 43



NOTE: Cross sections between Sta. 92 + 51.96 and Sta. 107 + 71.96 are taken along Channel Control Line at a bearing of S 18°50'34"E.

CURVE DATA

W.F.L. Curve No. 1
Δ = 24° 39' 45"
R = 1936.70'
T = 423.36'
L = 833.64'

W.F.L. Curve No. 2
Δ = 24° 45' 54"
R = 3192.04'
T = 700.79'
L = 1379.70'

Curve No. 3
Δ = 24° 45' 54"
R = ~~3691.98'~~
T = ~~810.59'~~
L = ~~1594.02'~~

Curve No. 4
Δ = 24° 39' 45"
R = 3928.88'
T = 858.86'
L = 1691.15'

E.F.L. Curve No. 5
Δ = 15° 43' 39"
R = ~~2603.23'~~
T = ~~359.56'~~
L = ~~714.58'~~

E.F.L. Curve No. 6
Δ = 24° 45' 54"
R = 2380.72'
T = 522.67'
L = 1028.02'

Curve No. 7
Δ = ~~76° 41' 09"~~
R = ~~239.46'~~
T = ~~194.57'~~
L = ~~320.79'~~

Curve No. 8
Δ = ~~52° 55' 20"~~
R = ~~390.00'~~
T = ~~192.94'~~
L = ~~313.76'~~

Curve No. 9
Δ = ~~17° 53' 56"~~
R = ~~15,085.29'~~
T = ~~236.00'~~
L = ~~499.95'~~

I-10 CHANNEL

Curve No. 10
Δ = 4° 15' 47"
R = 6992.67'
T = 260.27'
L = 520.30'

Curve No. 11
Δ = 4° 03' 37"
R = 7052.69'
T = 250.00'
L = 499.79'

Curve No. 12
Δ = 6° 25' 28"
R = 8353.84'
T = 468.64'
L = 936.69'

PROJECT OVERVIEW FOR SLA REACH

"AS-BUILT DRAWING"

I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

SLA
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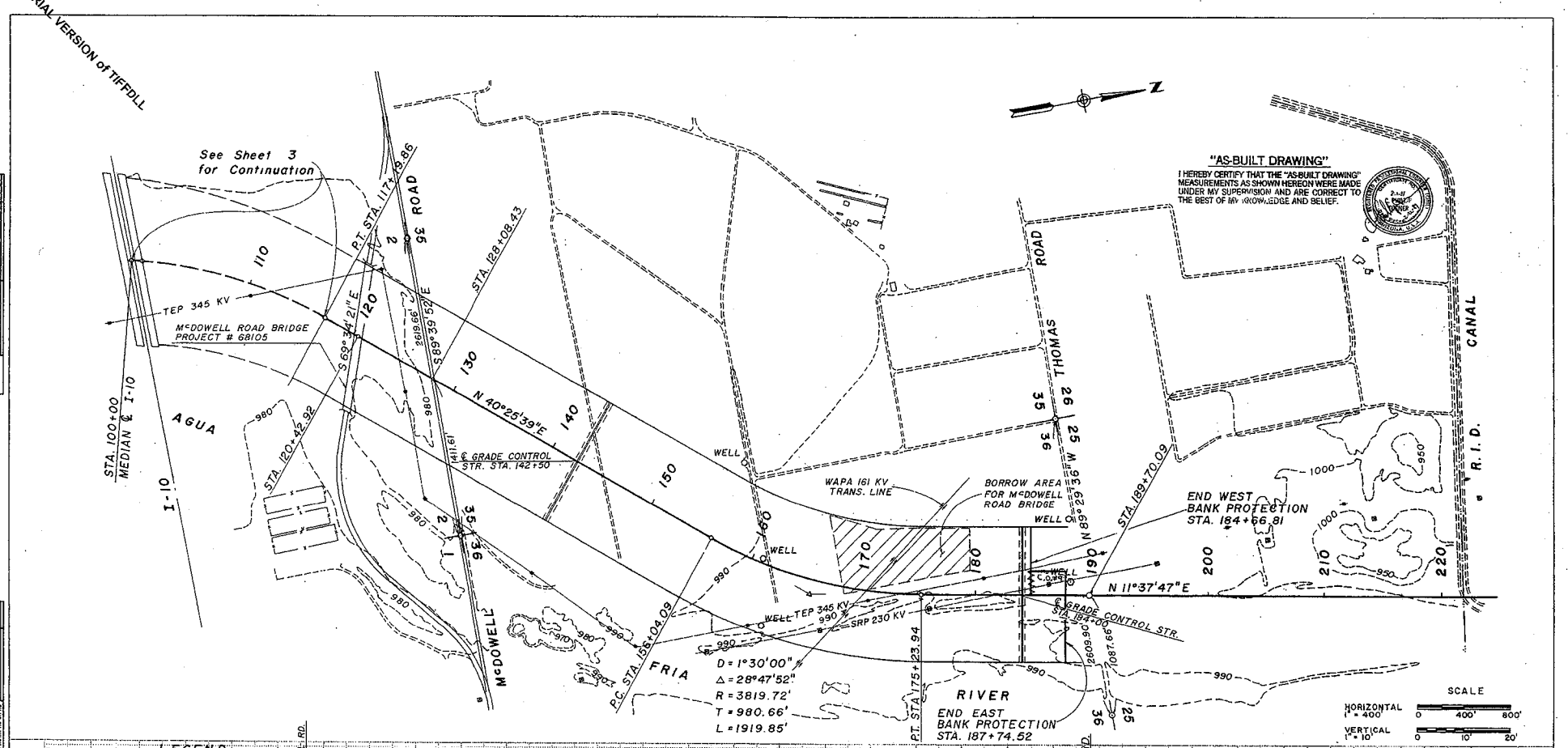
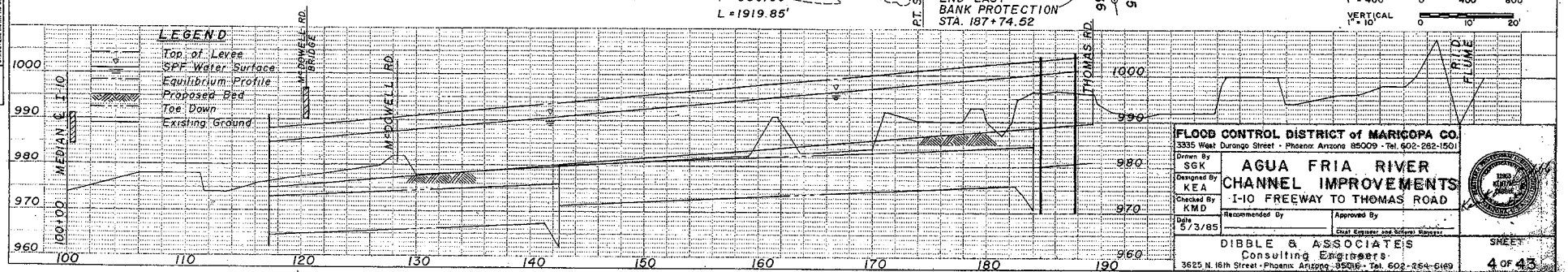
FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street - Phoenix Arizona 85009 - Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS
I-10 to McDowell Road

Project No.	AZ-MC-07
Date:	April '85
Design:	R.N.B. & E.E.C.
Drawn:	A.K.J.
Check:	J.K.L., J.B.L.
Revisions:	

TRIAL VERSION of TIFFDLL





Drawn By	SGK
Designed By	KEA
Checked By	KMD
Date	5/3/85

FLOOD CONTROL DISTRICT of MARICOPA CO.
3335 West Durango Street • Phoenix Arizona 85009 • Tel. 602-262-1501

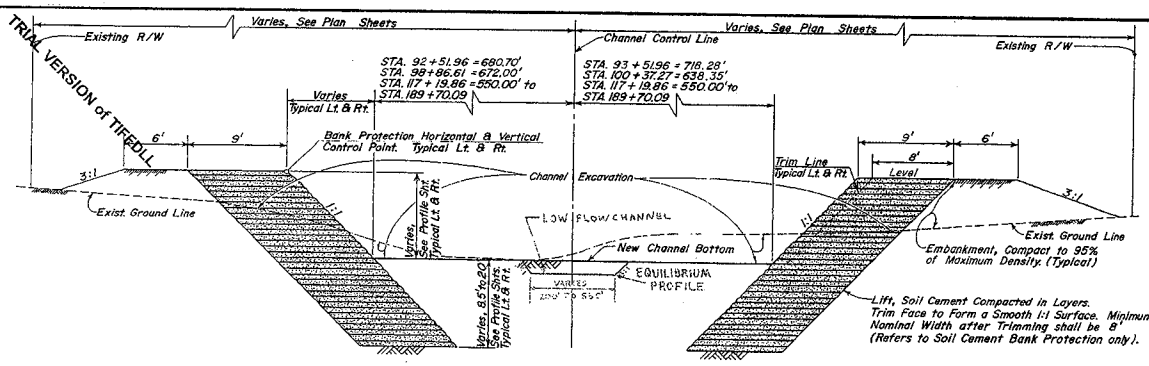
AGUA FRIA RIVER
CHANNEL IMPROVEMENTS
I-10 FREEWAY TO THOMAS ROAD

Recommended By

Approved By
Chief Engineer and Subregional Manager

DIBBLE & ASSOCIATES
Consulting Engineers
3625 N. 16th Street • Phoenix Arizona 85016 • Tel. 602-264-6169

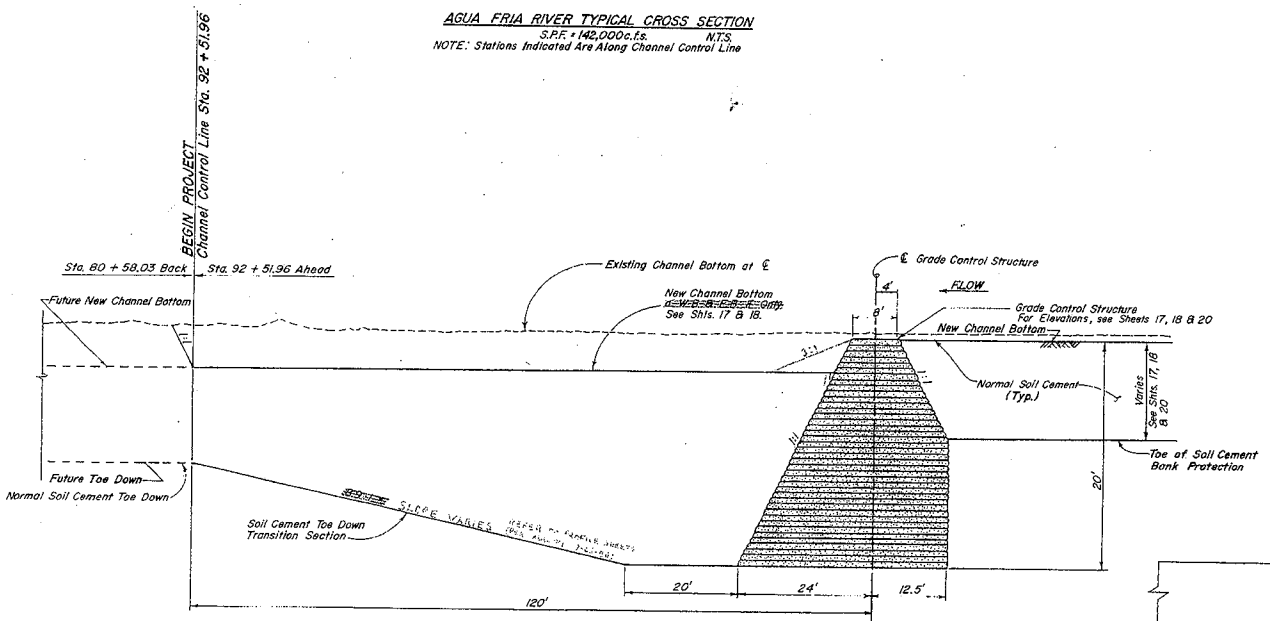
SHEET 4 OF 43



AGUA FRIA RIVER TYPICAL CROSS SECTION

S.P.F. = 142,000c.f.s. N.T.S.

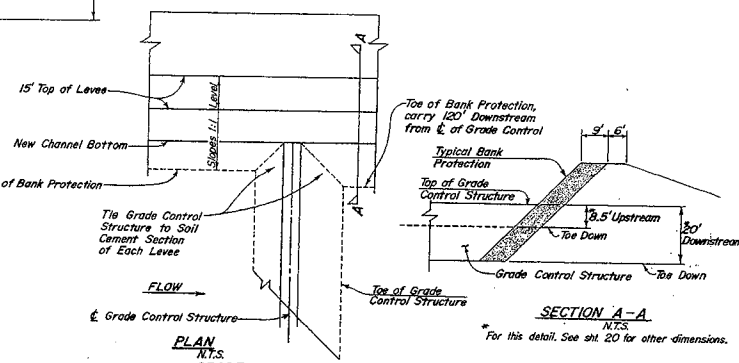
NOTE: Stations Indicated Are Along Channel Control Line



TYPICAL SECTION GRADE CONTROL STRUCTURE

STA. 93 + 71.96
STA. 142 + 50
STA. 184 + 00

Scale: Horz. 1"=10' Vert. 1" = 5'



PLAN N.T.S.

SECTION A-A N.T.S.

*For this detail. See sht. 20 for other dimensions.

GRADE CONTROL STRUCTURE TIE TO BANK PROTECTION

"AS-BUILT DRAWING"

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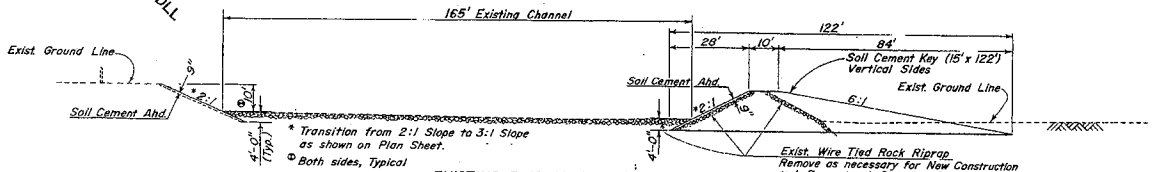
AGUA FRIA RIVER IMPROVEMENTS

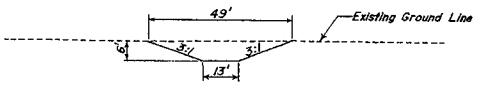
I-10 to McDowell Road

Project No: 82-MC-00
Date: April '85
Design: R.N.B.
Drawn: T.A.R.
Check: J.K.L., J.B.L.
Revisions:

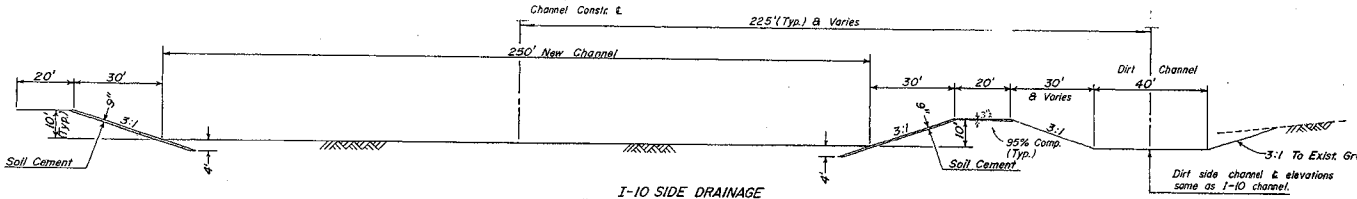
TRIAL VERSION of TIFFDLL



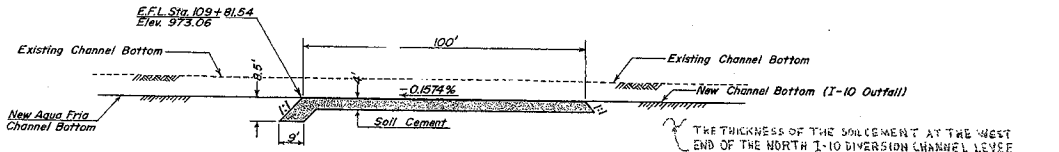
EXISTING I-10 SIDE DRAINAGE CHANNEL
LOOKING WEST Scale: 1"=20'
STA. 0+00 TO STA. 3+00±



SECTION D-D
TYPICAL DITCH SECTION
FOR 2-60" PIPE CULVERTS
AT McDOWELL ROAD
Scale: 1"=20'

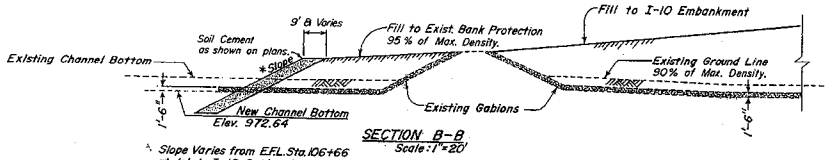


I-10 SIDE DRAINAGE
TYPICAL SECTION STA ~~11+00~~ 11+00 PER ADD #1 (3-15-95)
Scale: 1"=20'



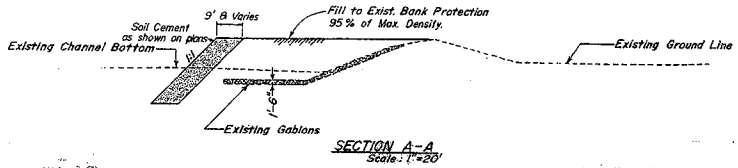
SECTION C-C
Scale: 1"=20'

THE THICKNESS OF THE SOILCEMENT AT THE WEST END OF THE NORTH I-10 DIVERSION CHANNEL LEVEE (STA. 29+25 TO STA. 30+35) IS A MINIMUM 9" THICKNESS PER ADD. #1 (3-15-95) (PAGE 8 OF 15)



SECTION B-B
Scale: 1"=20'

* Slope Varies from E.F.L. Sta. 106+66 at 1:1 to I-10 Outfall Channel Sta. 31+92.07 at 3:1



SECTION A-A
Scale: 1"=20'

NOTE: Location of Sections A-A, B-B, C-C & D-D are shown on Sht. No. 12.

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AGUA FRIA RIVER IMPROVEMENTS
I-10 to McDowell Road

Project No.	AZ-MC-07
Date:	April '85
Design:	R. N. B.
Drawn:	T. A. R.
Check:	J.K.L., J.B.L.
Revisions:	

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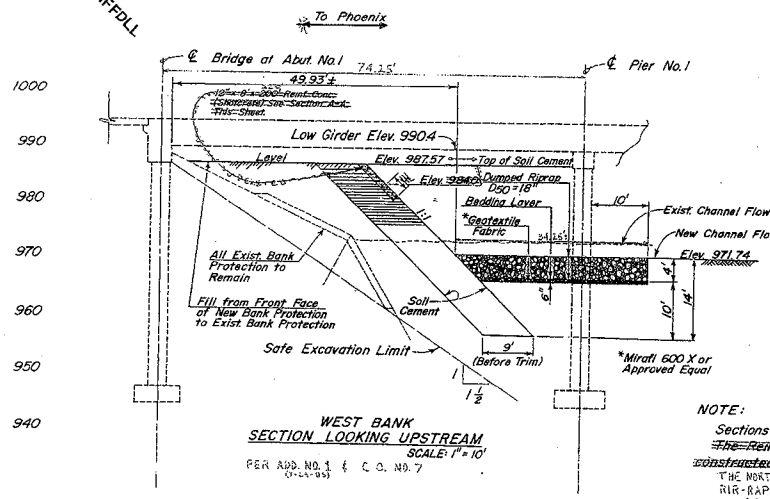
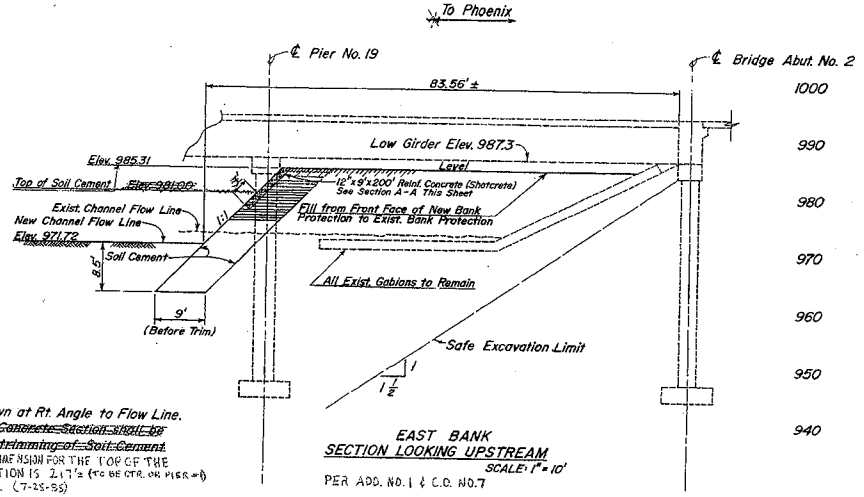


WEST BANK
SECTION LOOKING UPSTREAM
SCALE: 1" = 10'
PER ADD. NO. 1 & C.O. NO. 7

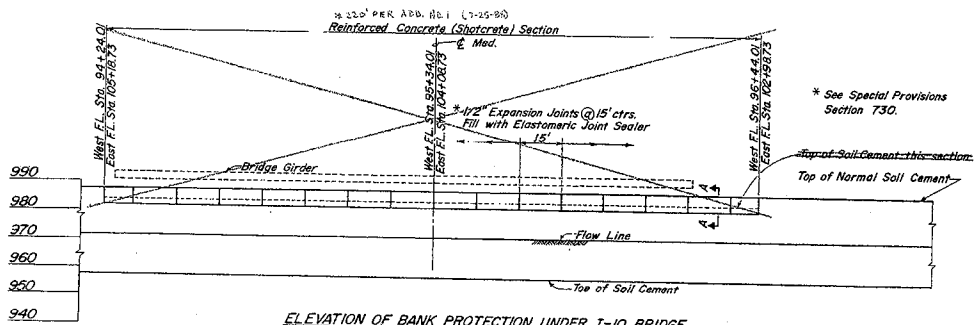


EAST BANK
SECTION LOOKING UPSTREAM
SCALE: 1" = 10'
PER ADD. NO. 1 & C.O. NO. 7

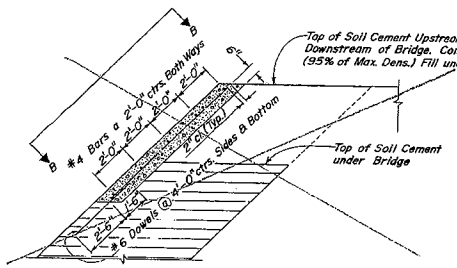
NOTE:
Sections are drawn at Rt. Angle to Flow Line.
~~The Reinforced Concrete Section shall be constructed after trimming of Soil Cement~~
THE NORTH-SOUTH DIMENSION FOR THE TOP OF THE RIP-RAP PROTECTION IS 2.17'± (TO BE CTR. OR PIER ⌀)
PER ADD. #1 (7-25-85)

BANK PROTECTION UNDER I-10 BRIDGE

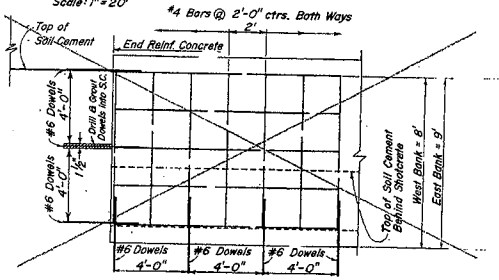
~~DELETED PER C.O. #7~~



ELEVATION OF BANK PROTECTION UNDER I-10 BRIDGE
Scale: 1" = 20'



SECTION A-A
Scale: 1" = 30'



SECTION B-B
Scale: 1" = 30'

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REGISTERED PROFESSIONAL ENGINEER — CERTIFICATE 20637 — C. PHILIP TURNER — ARIZONA, U.S.A.

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AGUA FRIA RIVER IMPROVEMENTS
I-10 to McDowell Road

Project No.	AZ-MC-07
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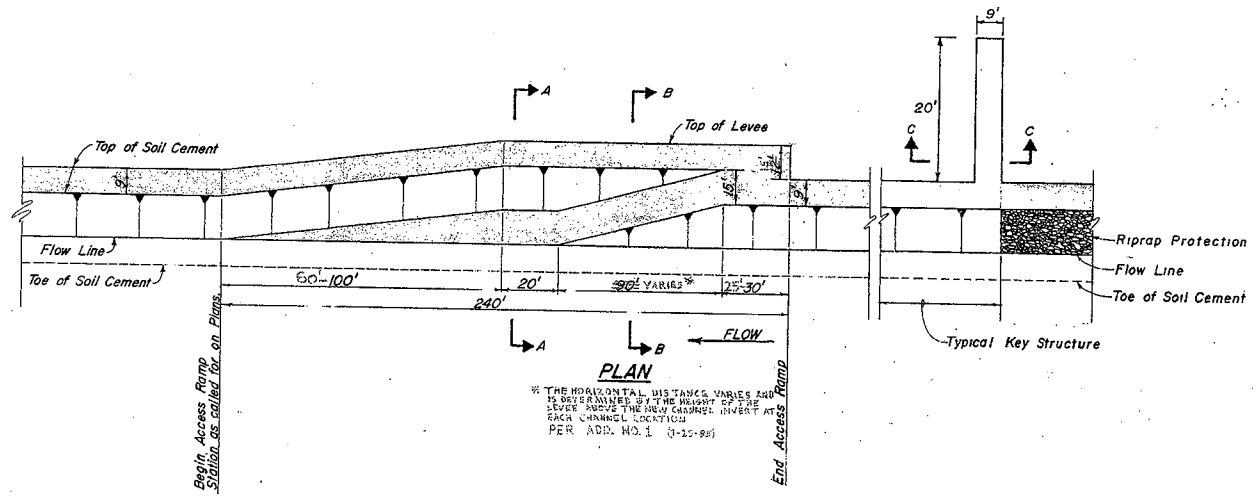
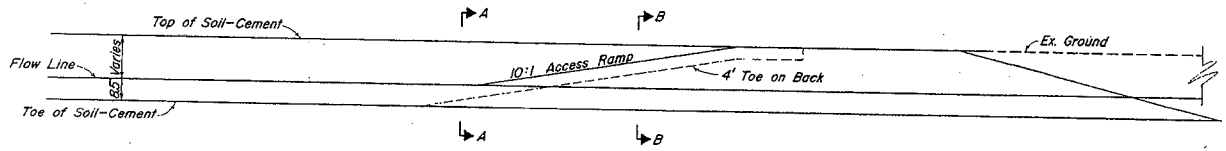
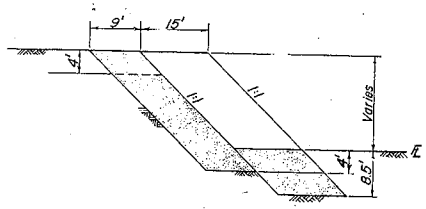


PLAN

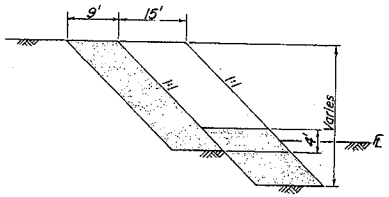
* THE HORIZONTAL DISTANCE VARIES AND IS DETERMINED BY THE HEIGHT OF THE LEVEE ABOVE THE NEW CHANNEL INVERT AT EACH CHANNEL LOCATION
PER ADD. NO. 1 (1-25-85)



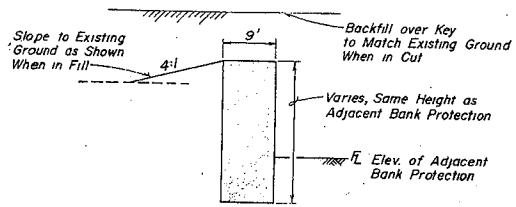
ELEVATION



SECTION A-A



SECTION B-B



SECTION C-C

ACCESS RAMP DETAILS

"AS-BUILT DRAWING"

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FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street - Phoenix, Arizona 85009 - TH. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS
I-10 to McDowell Road

Project No.	AZ-MC-07
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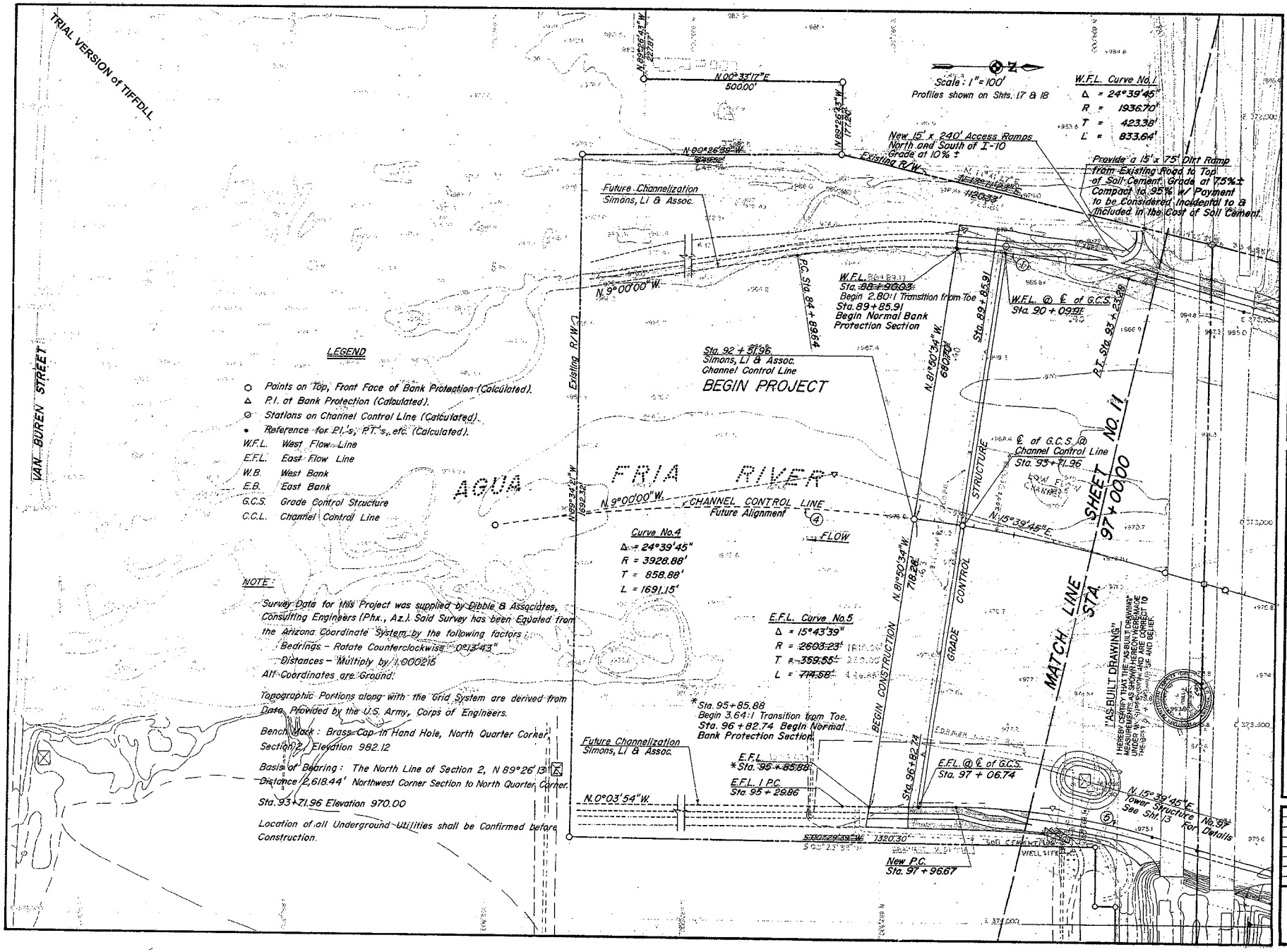
Design:	R.N.B.
Drawn:	A.K.J.
Check:	J.K.L., J.B.L.
Revisions:	



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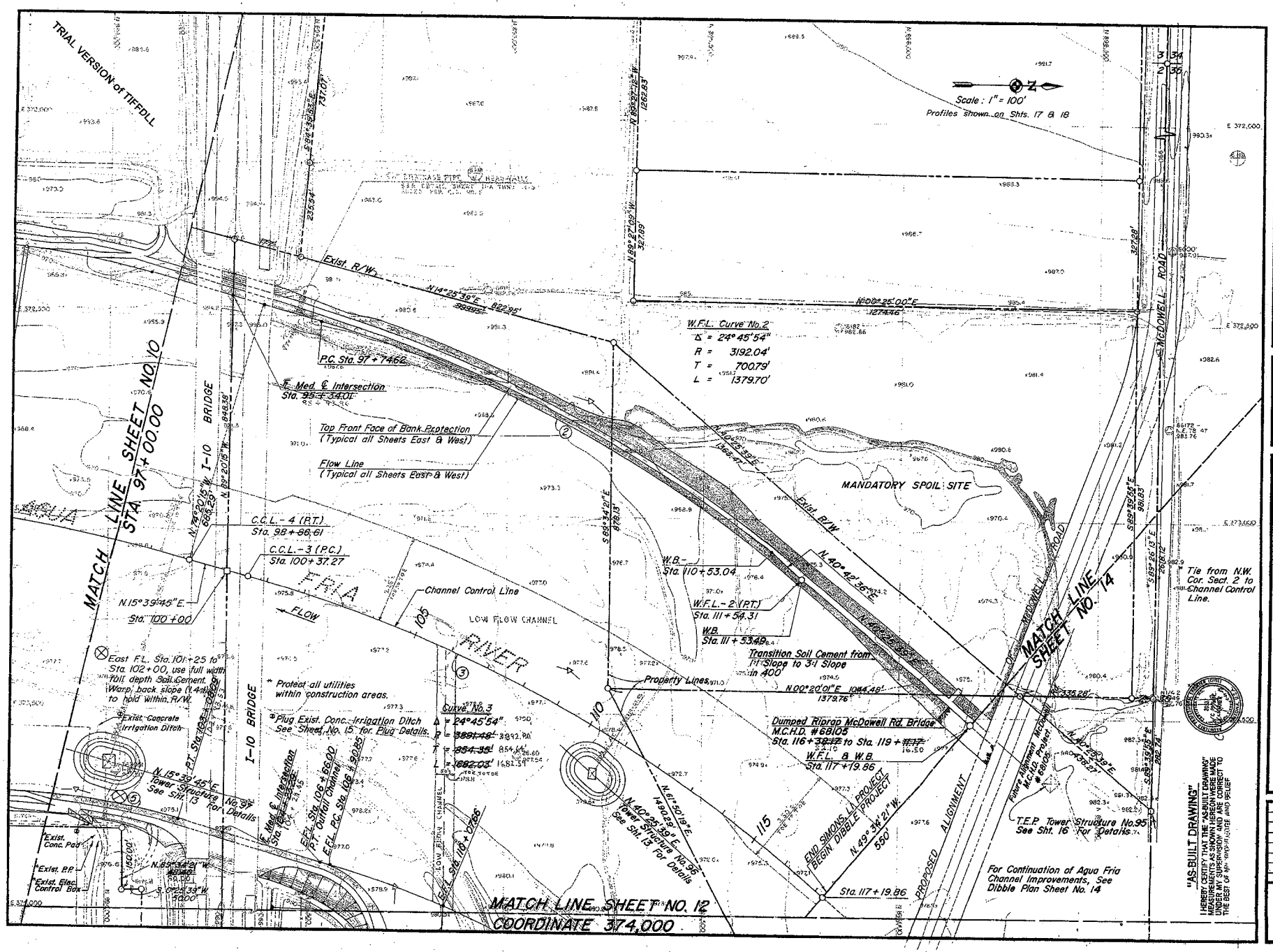
Revisions:	

10 OF 43



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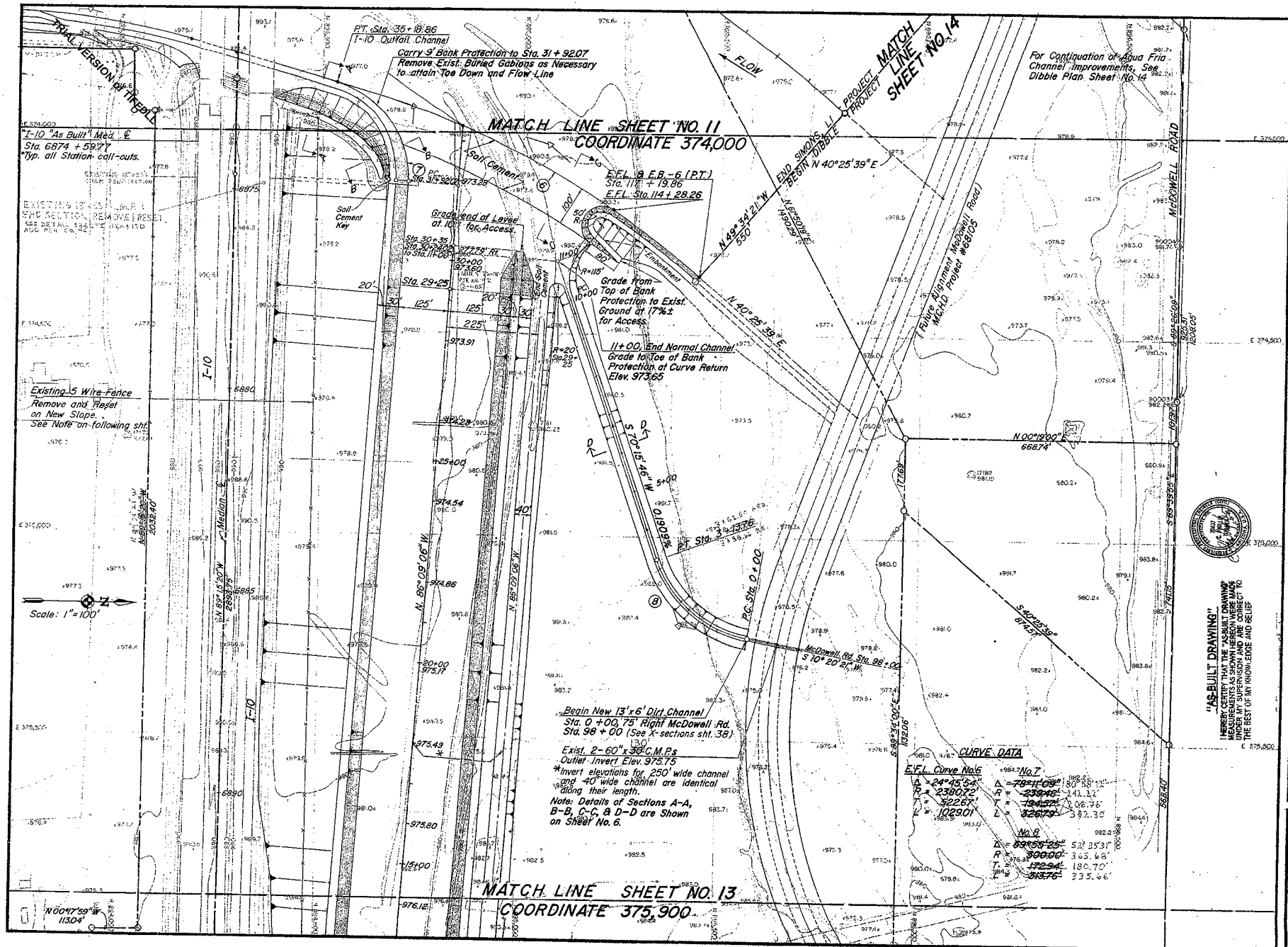
11 OF 43



"AS-BUILT DRAWING"
I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" HEREON ACCURATELY REPRESENTS THE WORK PERFORMED UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

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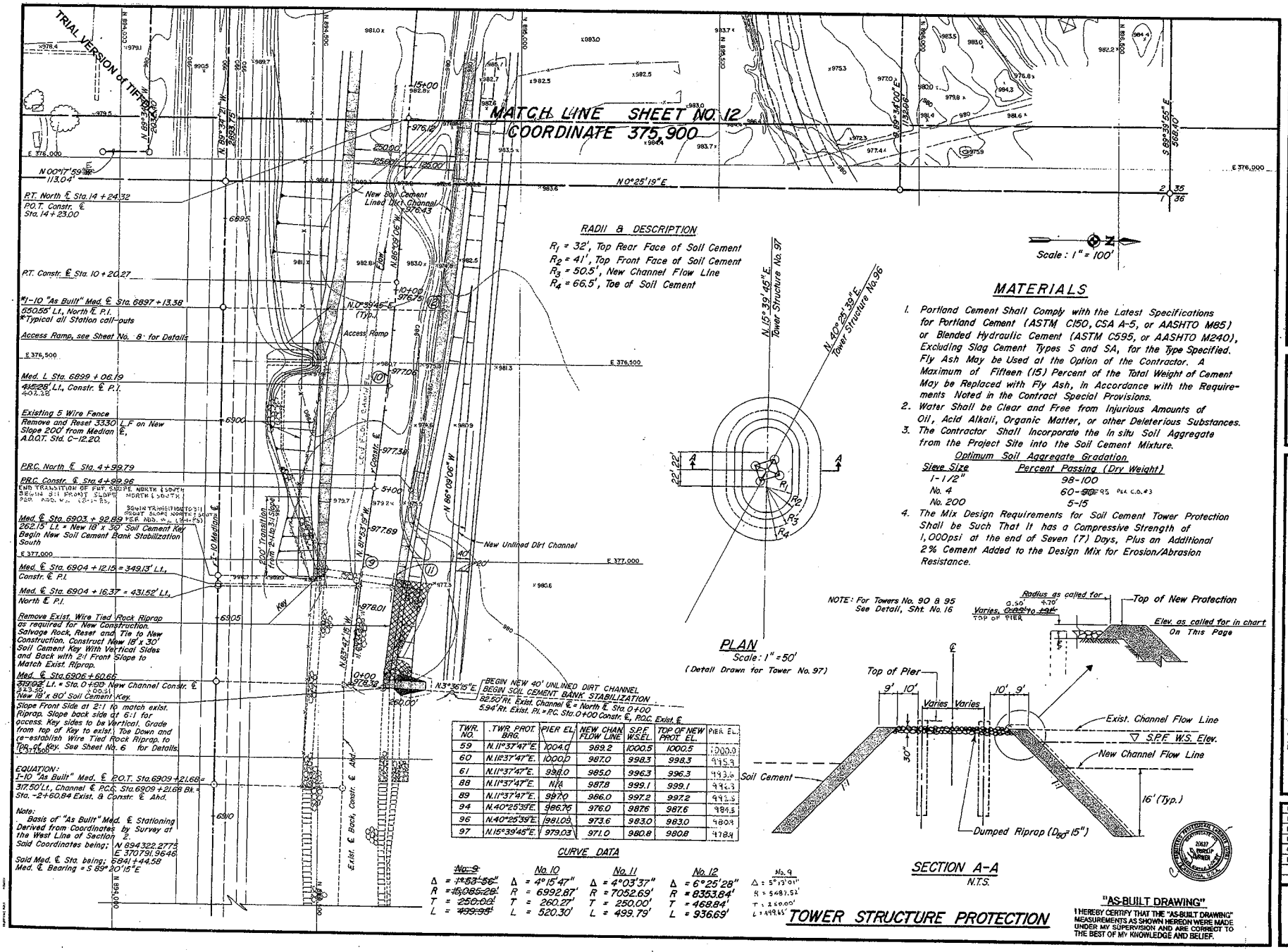
12 of 43



TWR. NO.	TWR. PROT. BRG.	PIER EL.	NEW CHAN. FLOW LINE	S.P.F. W.S.EL.	TOP OF NEW PROT. EL.	PIER EL.
59	N.11°37'47"E.	1004.0	989.2	1000.5	1000.5	1000.0
60	N.11°37'47"E.	1000.0	987.0	998.3	998.3	995.9
61	N.11°37'47"E.	996.0	985.0	996.3	996.3	993.6
88	N.11°37'47"E.	N/A	987.8	999.1	999.1	996.3
89	N.11°37'47"E.	997.0	986.0	997.2	997.2	994.5
94	N.40°25'39"E.	986.76	976.0	987.6	987.6	984.5
96	N.40°25'39"E.	981.05	973.6	983.0	983.0	980.8
97	N.15°39'45"E.	979.03	971.0	980.8	980.8	978.4

CURVE DATA

~~No. 9~~	No. 10	No. 11	No. 12	No. 9
~~Δ = 1°53'56"~~	Δ = 4° 15' 47"	Δ = 4°03'37"	Δ = 6°25'28"	Δ = 5°13'01"
~~R = 16,085.28'~~	R = 6992.87'	R = 7052.69'	R = 8353.84'	R = 5487.52'
~~T = 250.00'~~	T = 260.27'	T = 250.00'	T = 468.84'	T = 250.00'
~~L = 499.98'~~	L = 520.30'	L = 499.79'	L = 936.69'	L = 499.65'

TOWER STRUCTURE PROTECTION

"AS-BUILT DRAWING"
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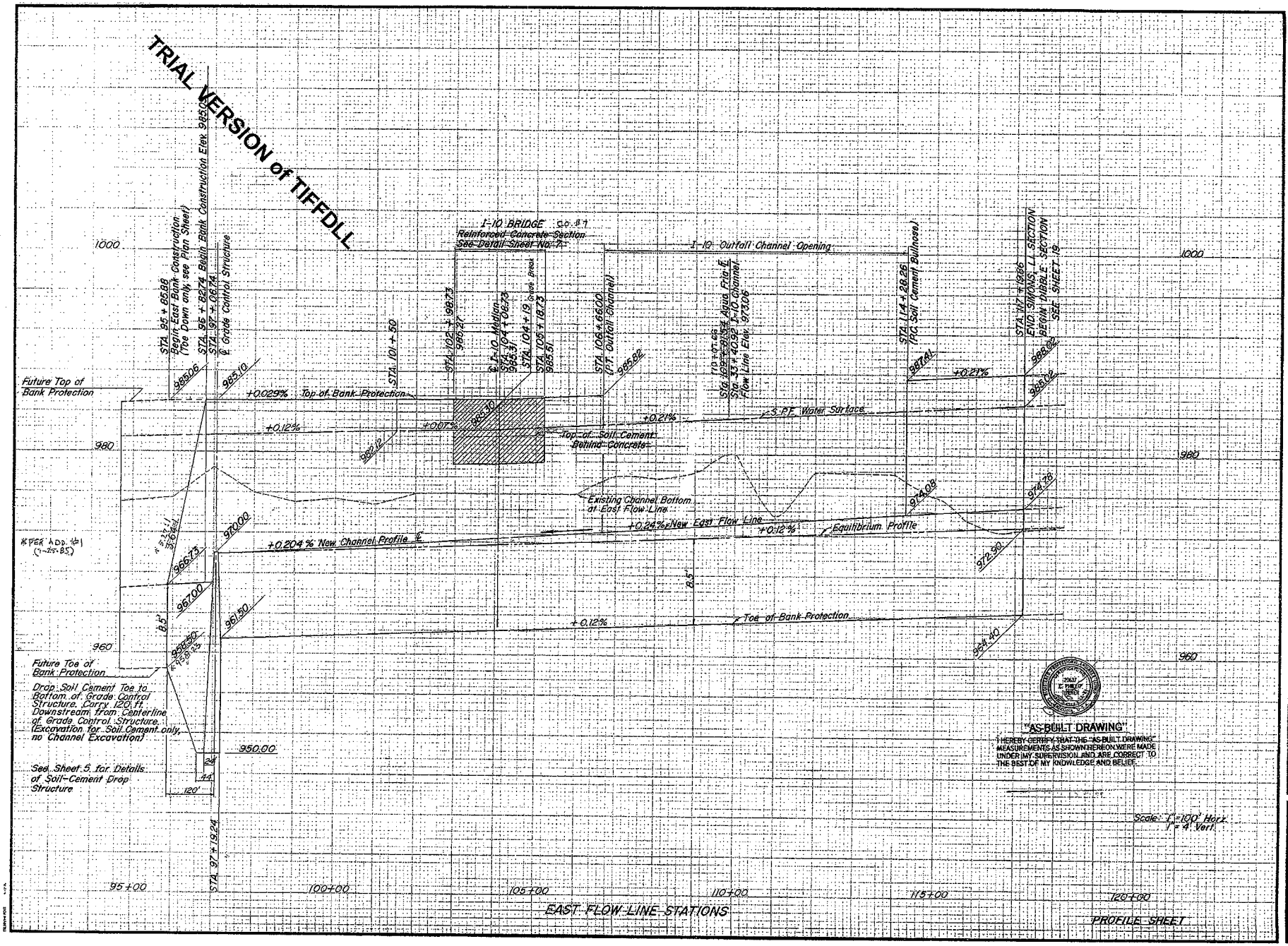
Revisions:	

13 OF 43



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3335 West Durango Street - Phoenix Arizona 85009 - TEL 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS

I-10 to McDowell Road

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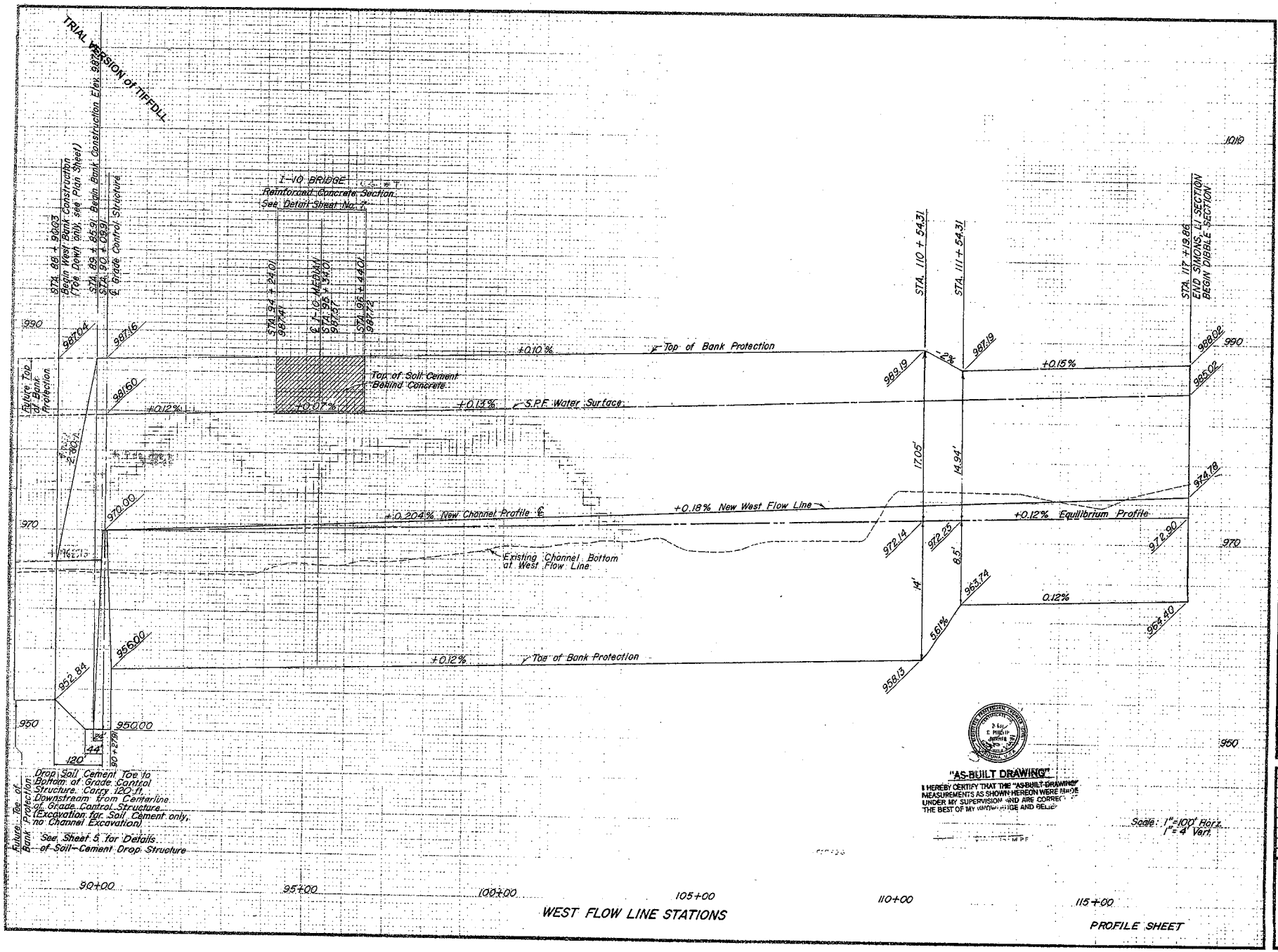
Date:	April '85
Design:	E.E.C., R.N.B.
Drawn:	M.A.F.
Check:	J.K.L., J. B.L.
Revisions:	

17 OF 43



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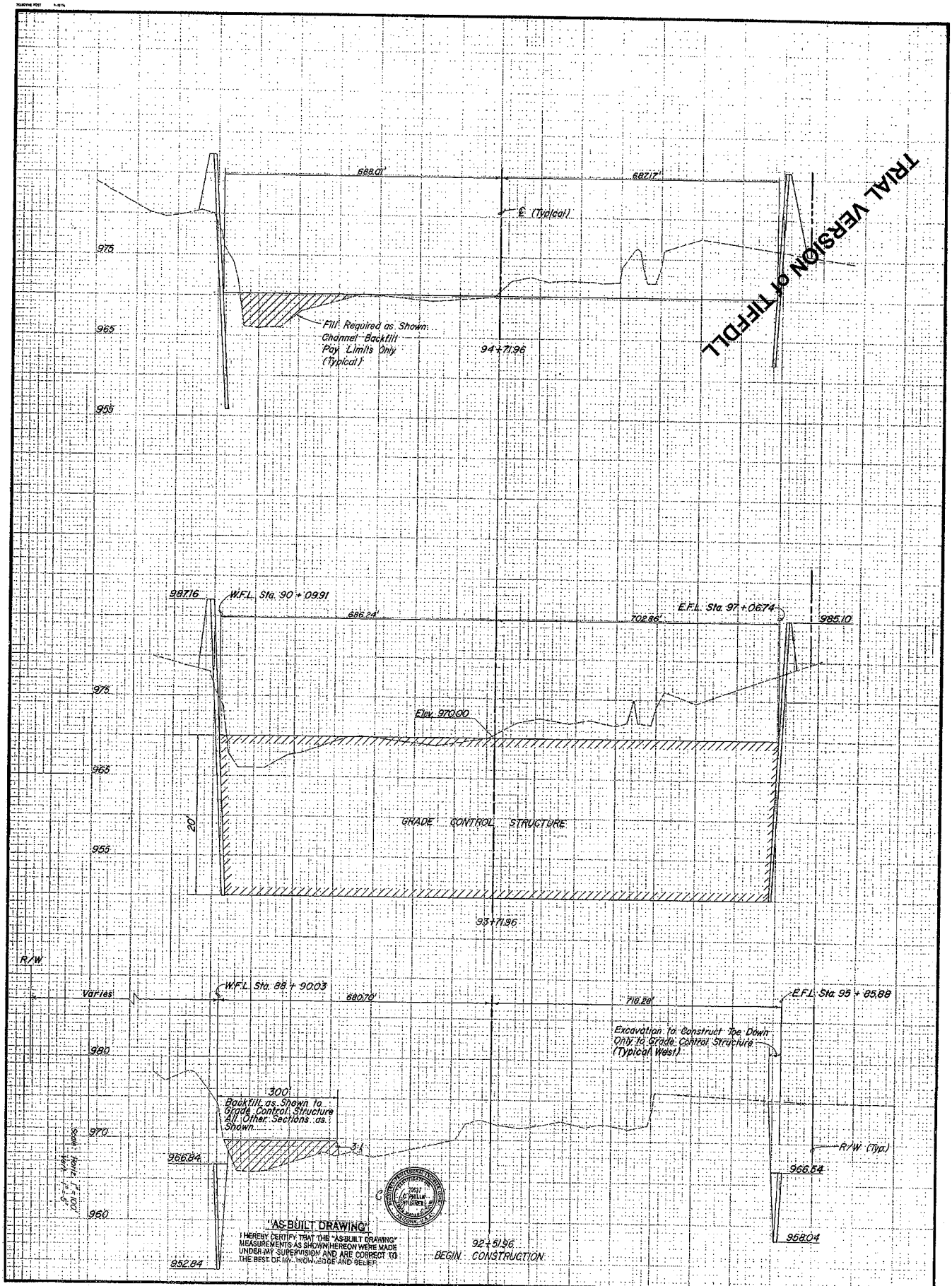
Check:	J.K.L., J.B.L.
Revisions:	



"AS-BUILT DRAWING"

I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

21 of 43

Project No. AZ-MC-07
Date: Apr. '85
Design: R.N.B.
Drawn: A.K.J.
Check: J.K.L. - J.B.L.
Revisions:

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AGUA FRIA RIVER IMPROVEMENTS

I-10 to McDowell Road

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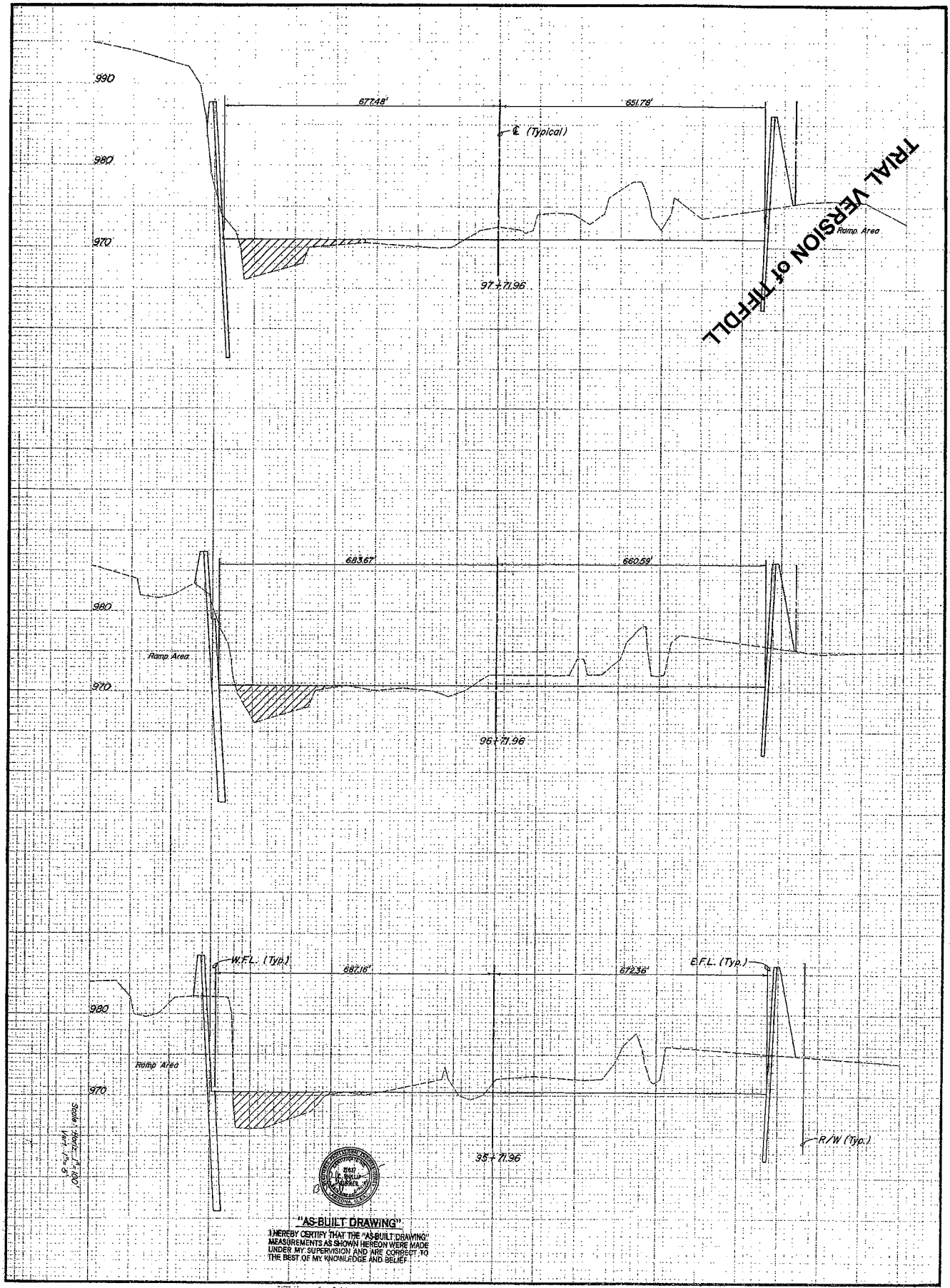

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Scale: Horiz. 1"=100'
Vert. 1"=5'

Project No: AZ-MC-07
Date: Apr. 89
Design: R.N.B.
Drawn: A.K.J.
Check: J.K.L., J.D.L.
Revisions:

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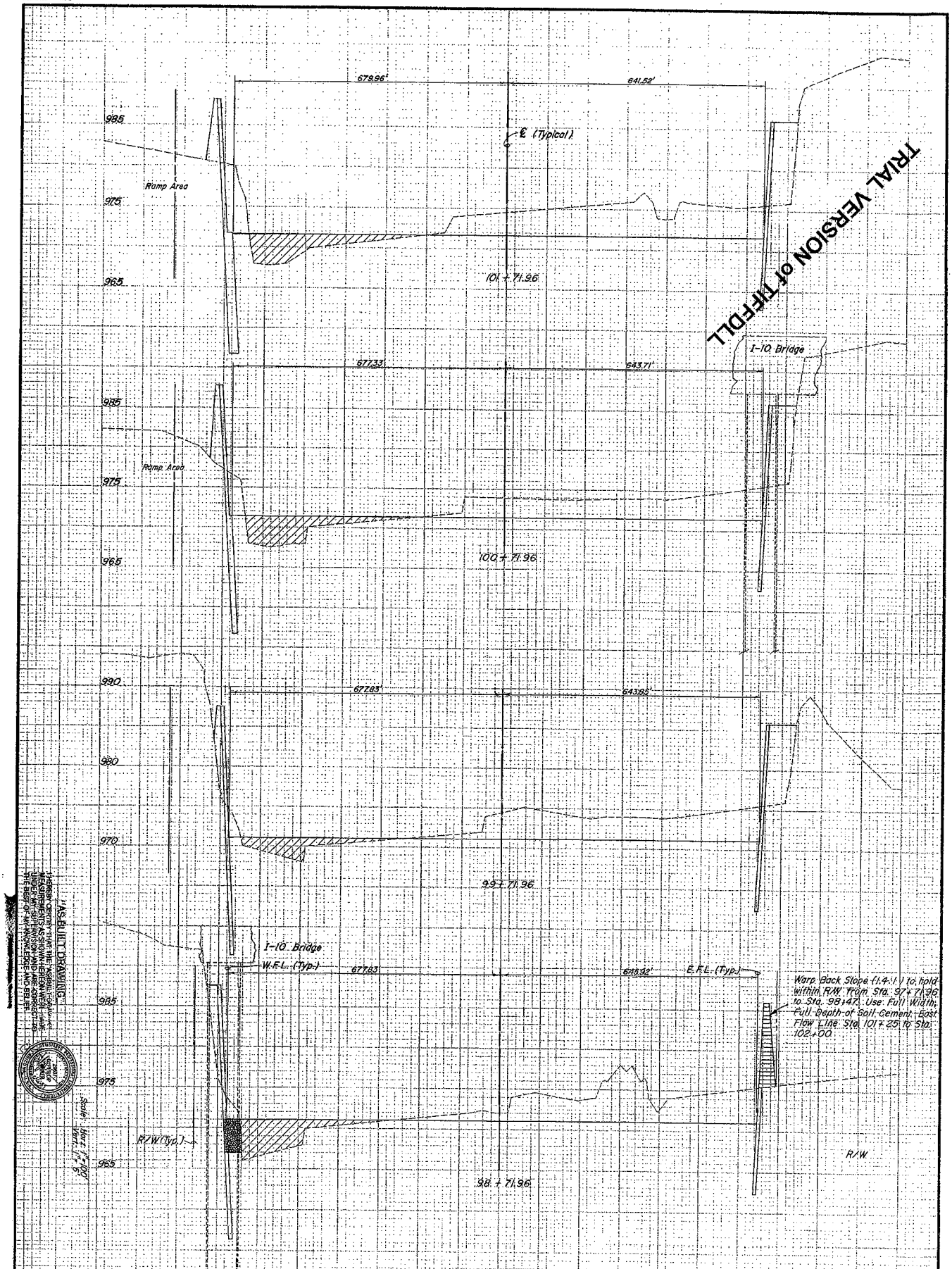

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I HEREBY CERTIFY THAT THE ASBUILT CONDITIONS SHOWN HEREON WERE OBTAINED BY ME OR UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Scale: Horz. 1" = 100'
Vert. 1" = 5'

Project No.	AZ-MC-07
Date: April '85	
Design: R.M.B., E.S.C.	
Drawn: M.A.F.	
Check: J.K.L., J.B.L.	
Revisions	

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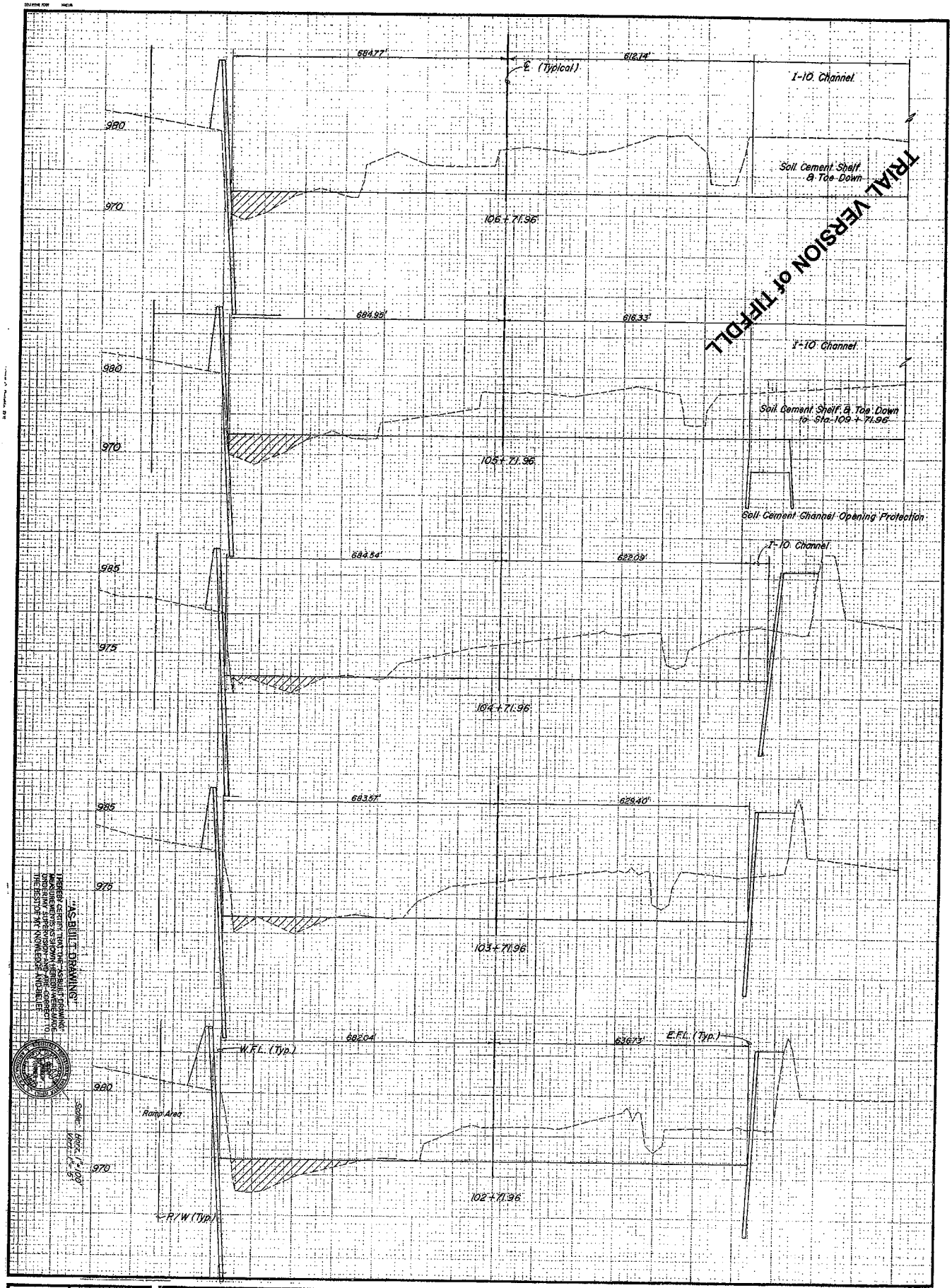

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Project No. AZ-MC-07
Design: RNB, EEG
Drawn: MAF
Checked: JKL, JBL
Revisions:

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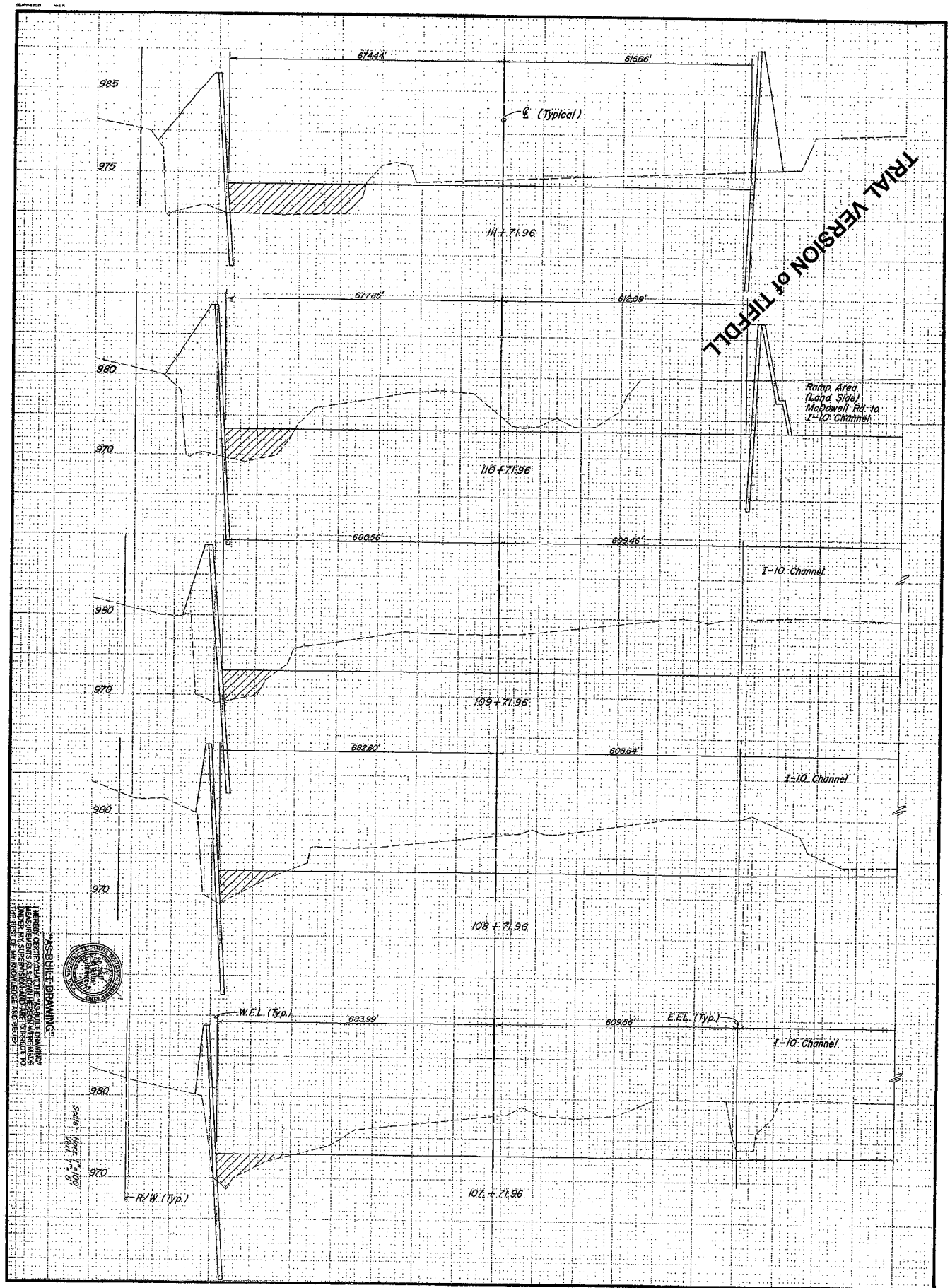

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Scale: Horiz. 1"=100' Vert. 1"=5'

Project No.	AZ-MC-07
Date:	April '85
Designs:	R.N.B., E.E.C.
Drawn:	M.A.F.
Check:	J.K.L., J.B.L.
Revisions:	

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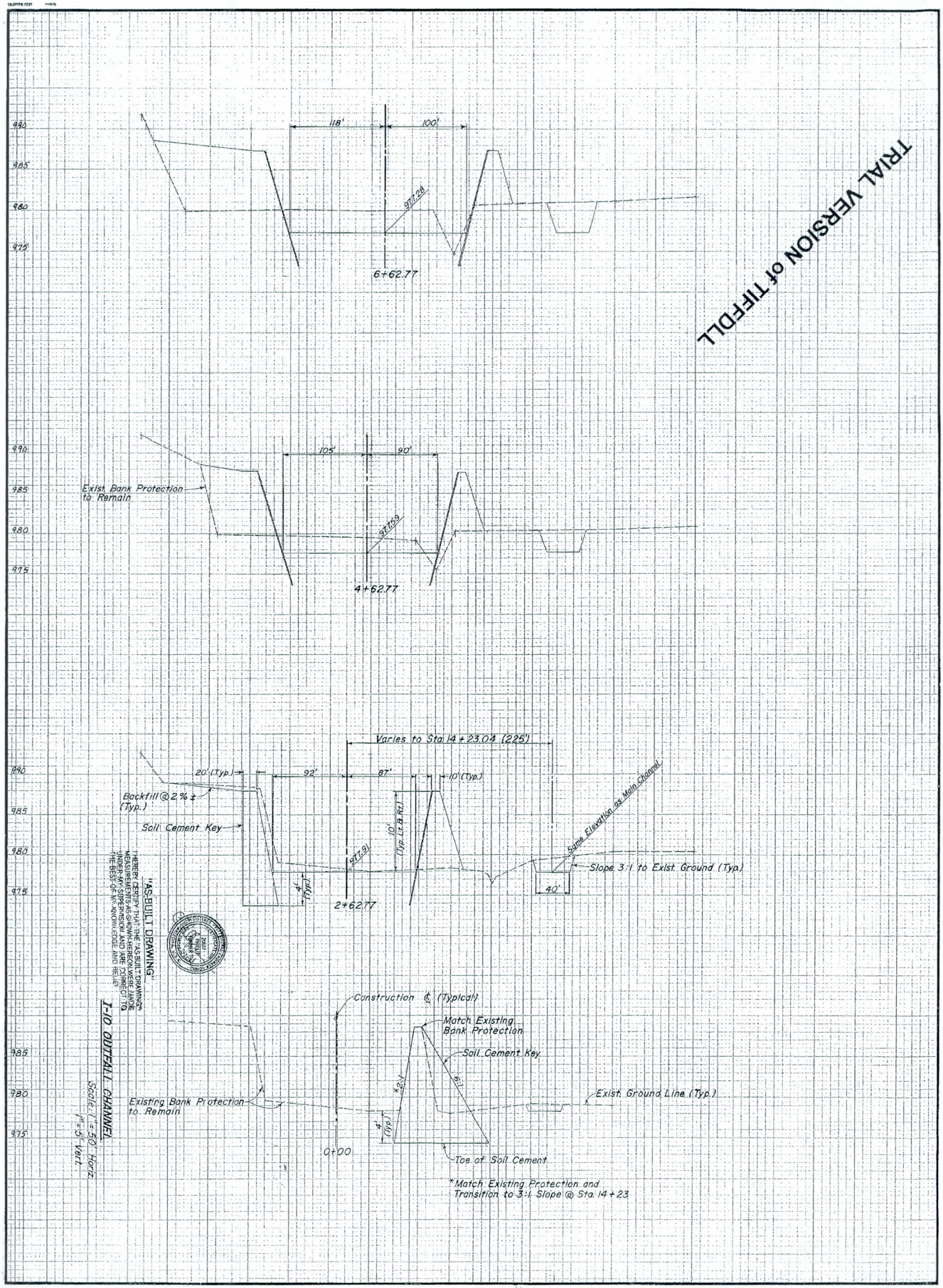

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I-10 OUTFALL CHANNEL

Scale: 1" = 50' Horz.
1" = 5' Vert.

Project No.	AZ-MC-07
Date:	April '85
Design:	R. N. B.
Drawn:	M. A. F.
Check:	J. K. L. / J. B. L.
Revisions:	

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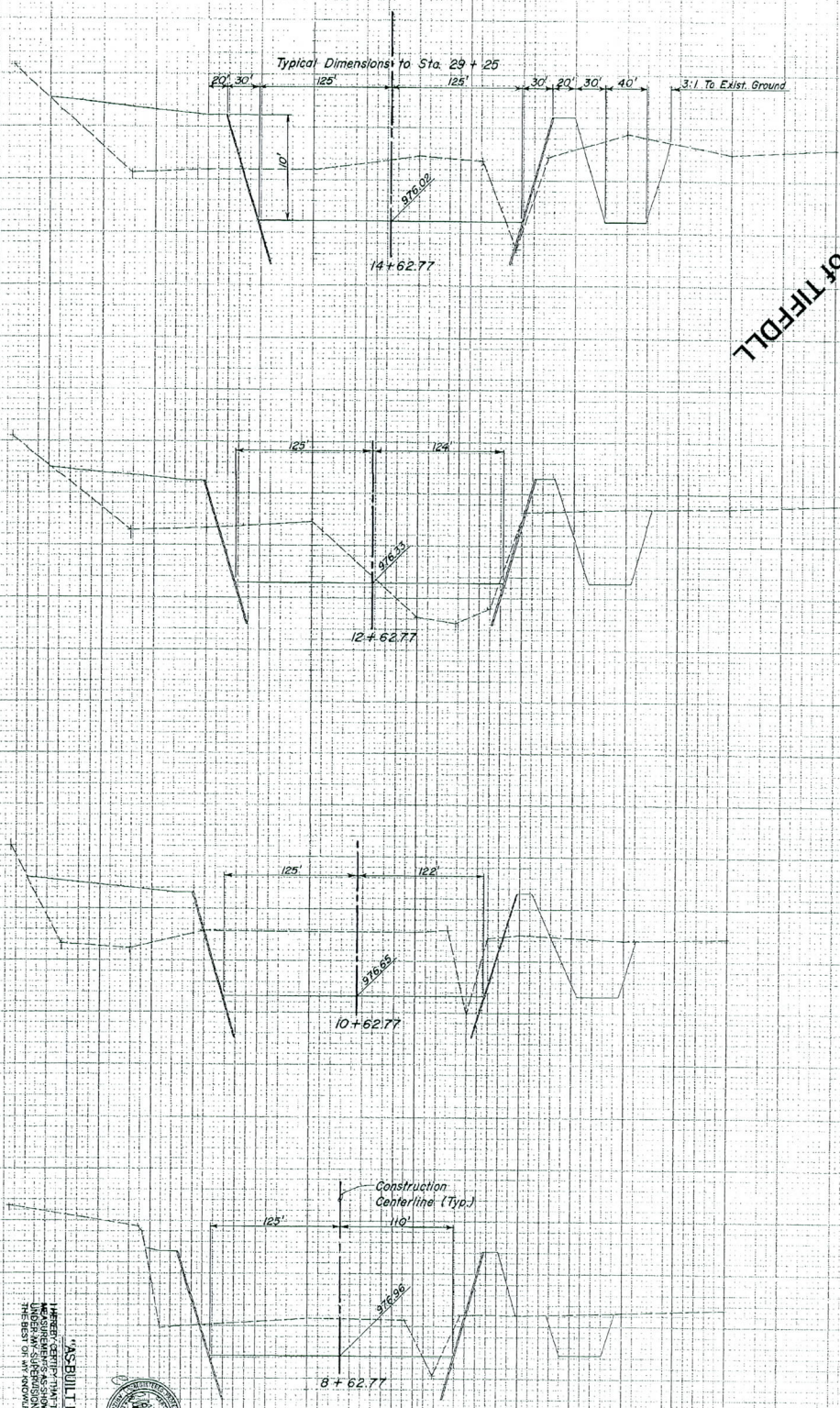

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I-10 OUTFALL CHANNEL

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Project No. AZ-MC-07	
Date: April '85	
Design: R.N.B.	
Drawn: M.A.E.	
Checked: J.K.L., J.B.L.	
Revisions:	

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I-10 to McDowell Road

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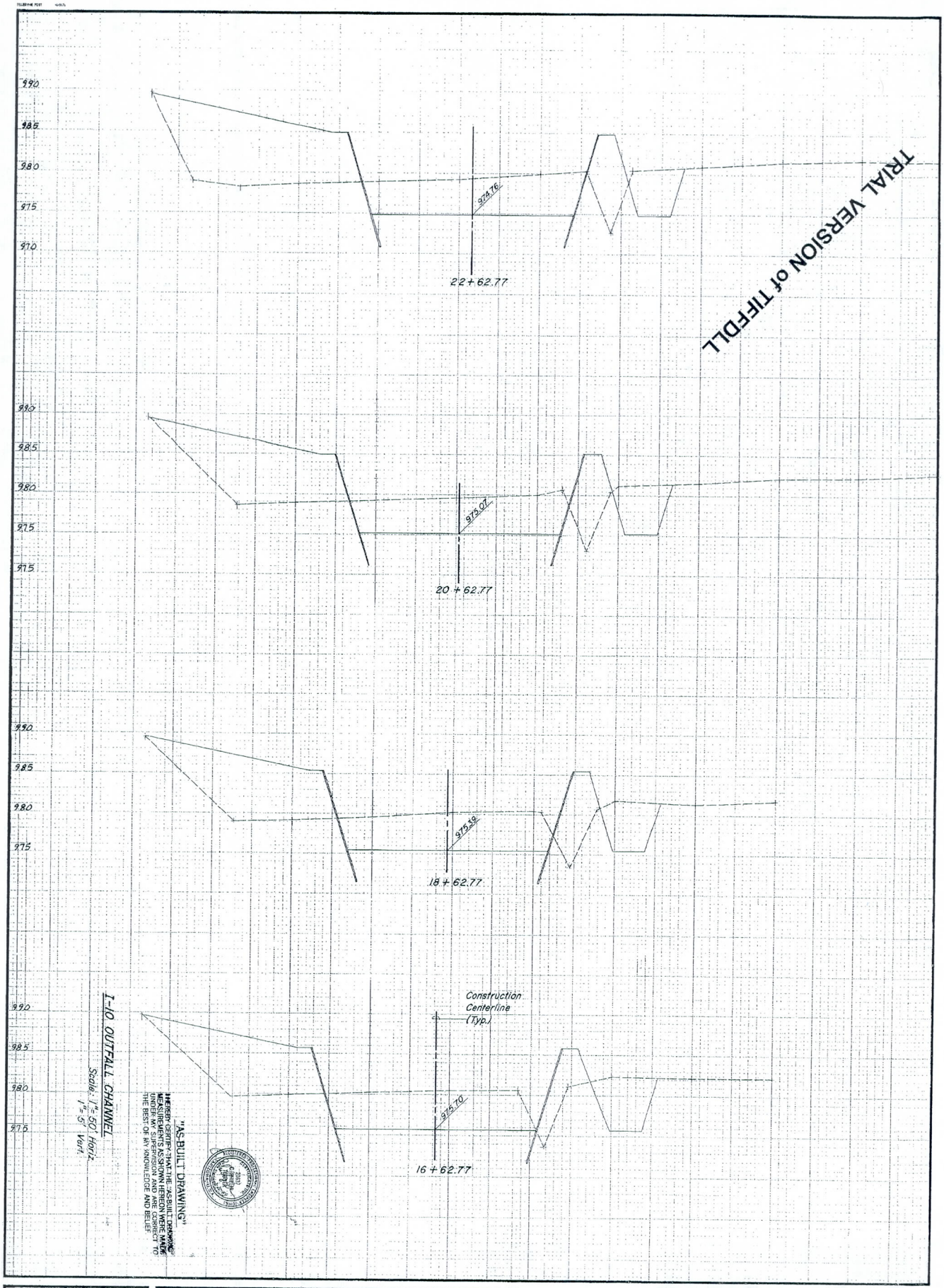

TRIAL VERSION of TIFFOLL

I-10 OUTFALL CHANNEL

Scale: 1"=50' Horiz.
1"=5' Vert.

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AGUA FRIA RIVER IMPROVEMENTS

I-10 to McDowell Road

Project No. AZ-MC-07
Date: April '85
Design: R.N.B.
Drawn: M.A.F.
Check: J.K.L., J.B.L.
Revisions:

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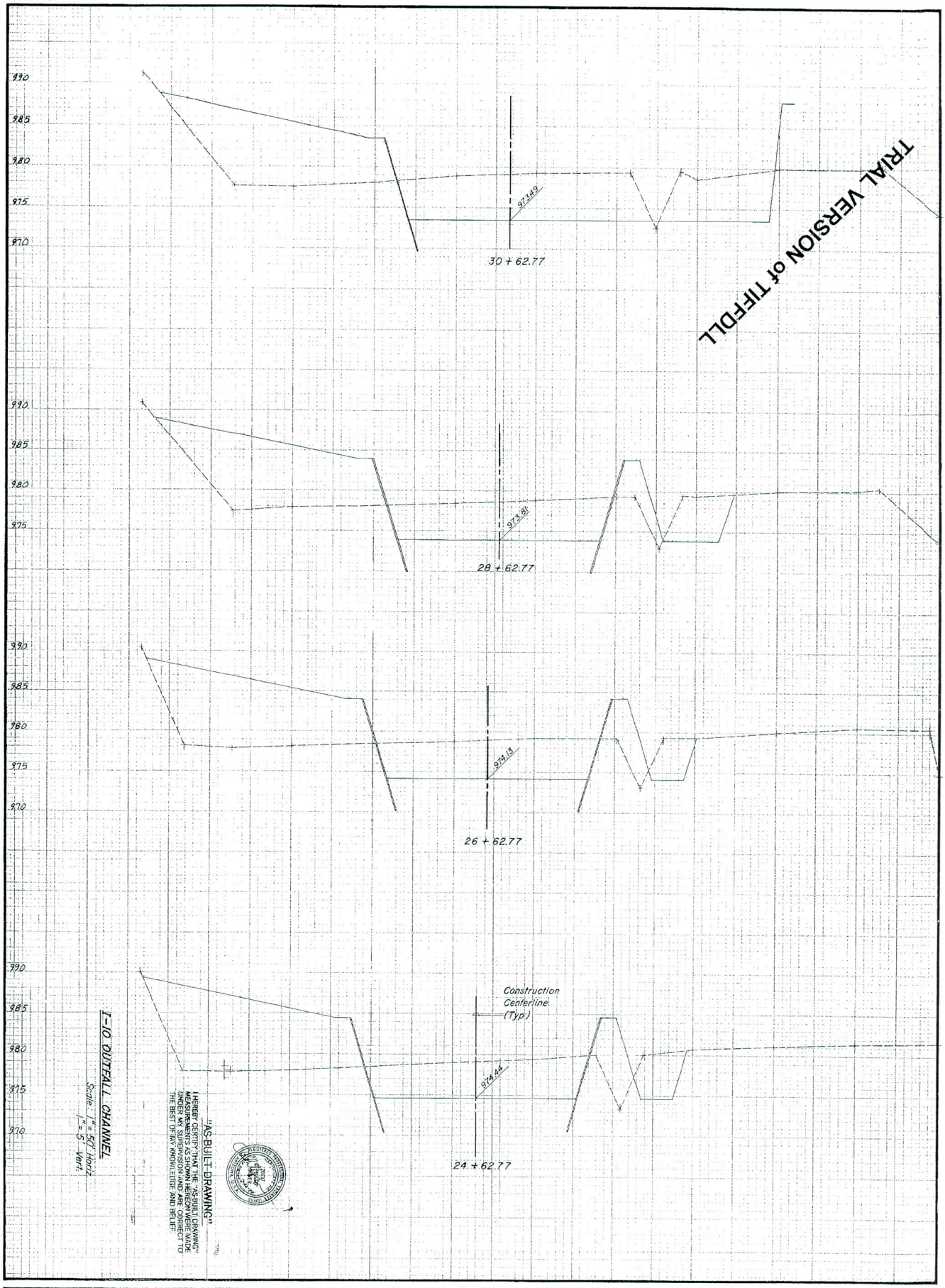
TRIAL VERSION of TIEFDLL



I-10 OUTFALL CHANNEL

Scale: 1" = 50' Horiz.
1" = 5' Vert.

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I HEREBY CERTIFY THAT THE "AS-BUILT DRAWING" HEREON REPRESENTS CONSTRUCTION AS SHOWN HEREON WHERE MADE UNDER MY DIRECTION AND SUPERVISION AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

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I-10 to McDowell Road

Project No. AZ-MC-07
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Drawn: M.A.F.
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Revisions:

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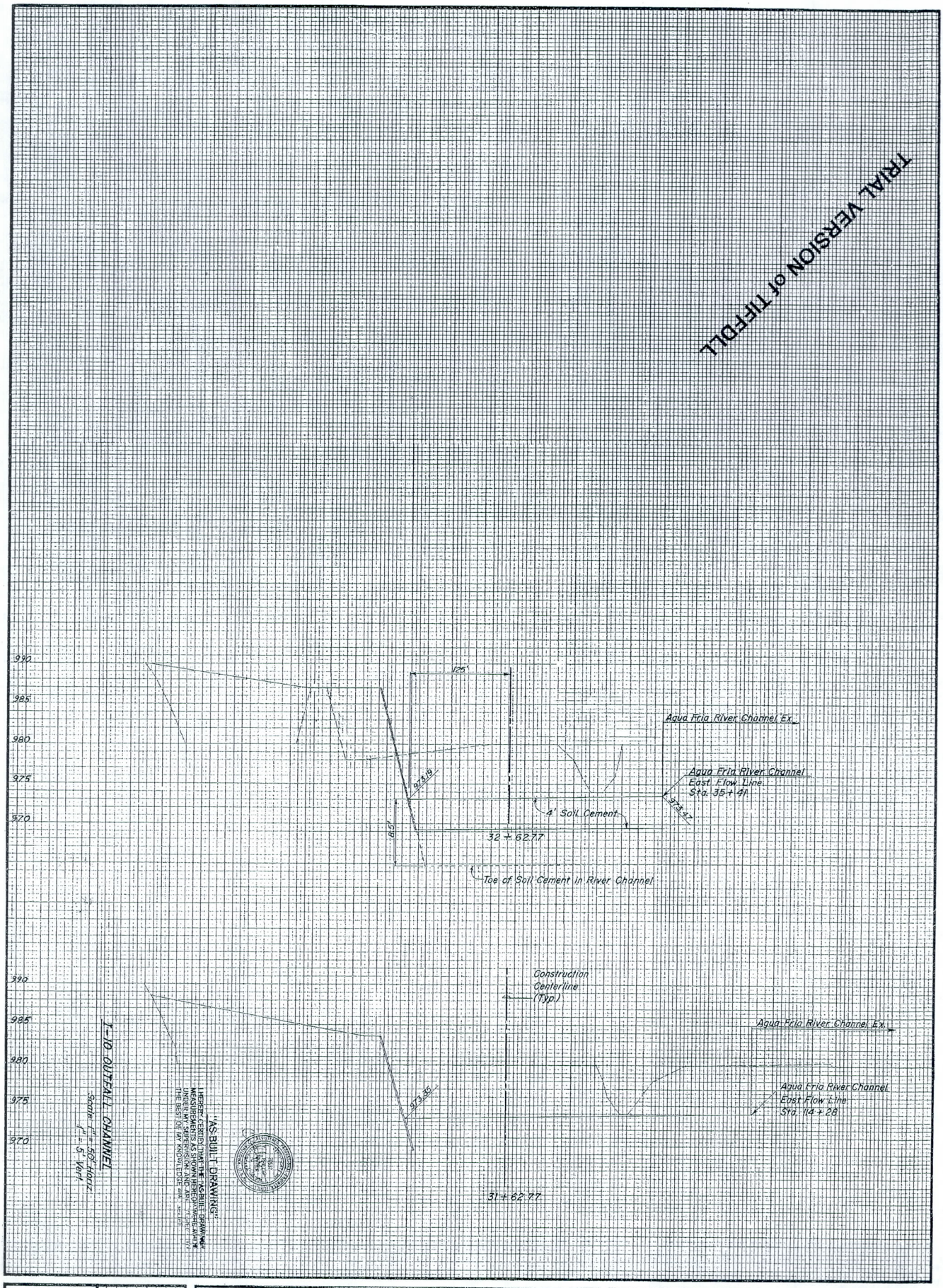

Project No.	AZ-MC-07
Date	Apr., '85
Design	R.N.R.
Drawn	J.H.M.
Check	J.K.L., J.B.L.
Revisions	

43 of 43

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AGUA FRIA RIVER IMPROVEMENTS

I-10 to McDowell Road

sla
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fort collins • cheyenne • denver • tucson • newport beach • pittsburgh
p.o. box 2712, tucson, arizona 80771 phone 602-884-9594

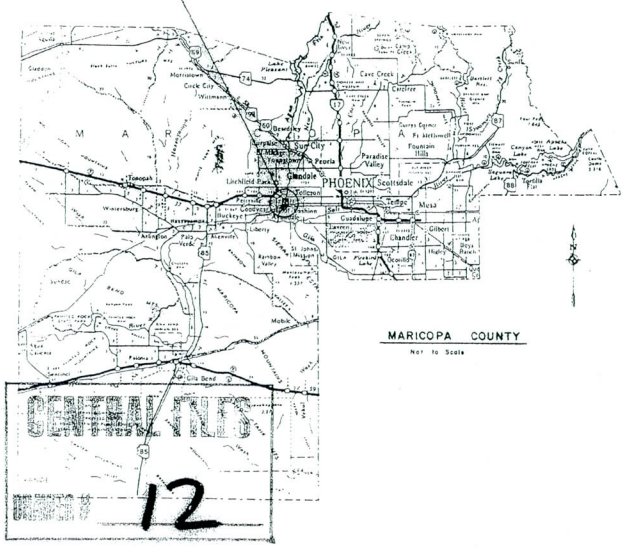
TRIAL VERSION of TIFFDLL

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

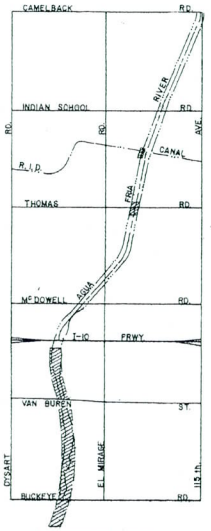
CONSTRUCTION PLANS
FOR

AGUA FRIA RIVER IMPROVEMENTS
BUCKEYE ROAD TO I-10
FCD 85-37

F.C.D. CONTRACT No. 85-37



MARICOPA COUNTY
Not to Scale



△ VICINITY MAP
N.T.S.

△ DRAWINGS CONTENTS

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STATION 33+00 TO 57+26	5
STATION 57+26 TO 79+88	6
EAST BANK PROFILE	7,8
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△ EARTHWORK CROSS SECTIONS	17-48
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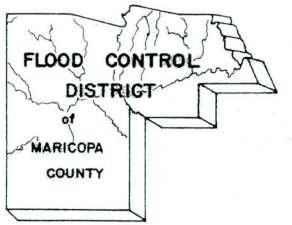

RECORD DRAWING
PROJECT ENGINEER
DATE

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Drawn By GD/EB	AGUA FRIA RIVER IMPROVEMENTS
Designed By RAM	BUCKEYE ROAD TO I-10
Checked By LEL/GRL/W	
Date 12/86	Recommended By / Approved By

253-1000

sla Simons, Li & Associates Inc. Suite 200 (602) 994-0777

SHEET 1/53

△ 1-16-87 L...

85-37

CENTRAL FILES
12

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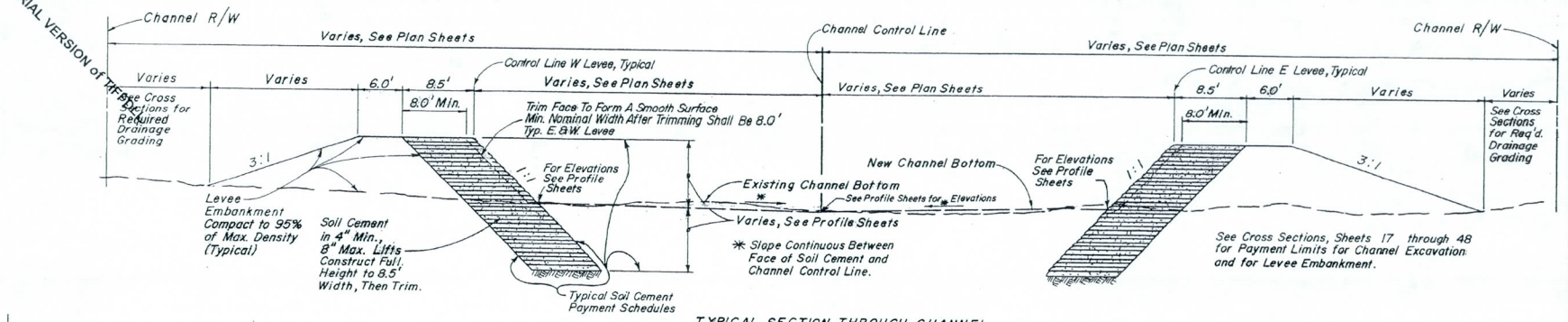
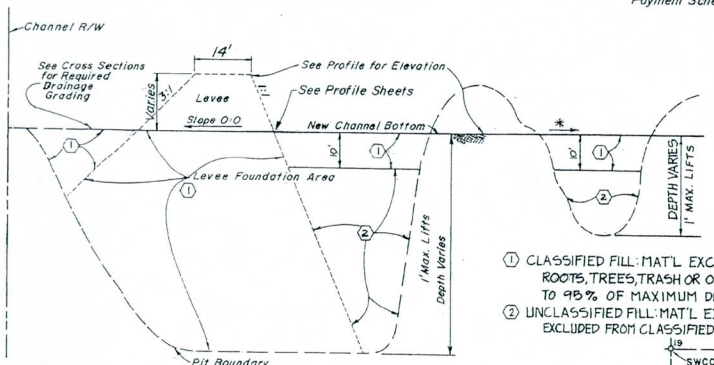


TYPICAL SECTION THROUGH CHANNEL

NTS



DETAIL FOR BACKFILLING OF PITS

MAXIMUM LIFT THICKNESS = 12" NTS

SECTION CORNER & 1/4 CORNER COORDINATES

POINT	NORTHING	EASTING	DESCRIPTIONS
1	896,616.3558	376,061.7919	3/4" IRON BAR @ NECOR SEC. 2
2	896,642.1482	373,442.2562	BRASS CAP IN H.H. @ N1/4 SEC. 2
3	896,667.8800	370,823.9100	BRASS CAP IN H.H. @ NWCOR. SEC. 2
5	891,426.9007	370,752.5392	1/2" REBAR IN H.H. @ SWCOR. SEC. 2
6	888,780.0616	370,282.5866	BRASS CAP IN H.H. @ W1/4 SEC. 11
8	891,276.5341	376,027.8001	1 1/2" IRON PIPE IN H.H. @ SECOR. SEC 2
9	888,738.9291	376,033.3076	1/2" REBAR @ E1/4 SEC. 11
11	893,948.1889	376,036.3060	3/4" IRON BAR INSIDE IRON PIPE @ E1/4 SEC. 2
18	886,161.2827	376,038.6399	BRASS CAP IN H.H. @ SECOR. SEC. 11
19	886,135.8328	370,751.6838	MOHI HIGHWAY DIV. ALUM. CAP @ SWCOR. SEC. 11
20	886,039.2986	372,559.4964	MAIL 0.2' BELOW PVMT. P.T. BUCKEYE ROAD

NOTE:

Survey data for this project was supplied by Andrews Atherton, Inc. (Phoenix, Arizona). Existing ground cross sections were obtained August through December 1984 by Brooks, Harvey & Associates, Phoenix, Arizona. The above listed coordinates are state plane modified coordinates at ground level. To convert to state plane coordinates distances between the coordinates should be divided by 1.0001215. The coordinates for the Northwest corner of Section 2 (N = 896,667.88 E = 370,823.91) were held the same for ground and state plane.

Bench Mark: USCE B.C. near Southeast corner of Buckeye Road Bridge.
Elevation 972.01

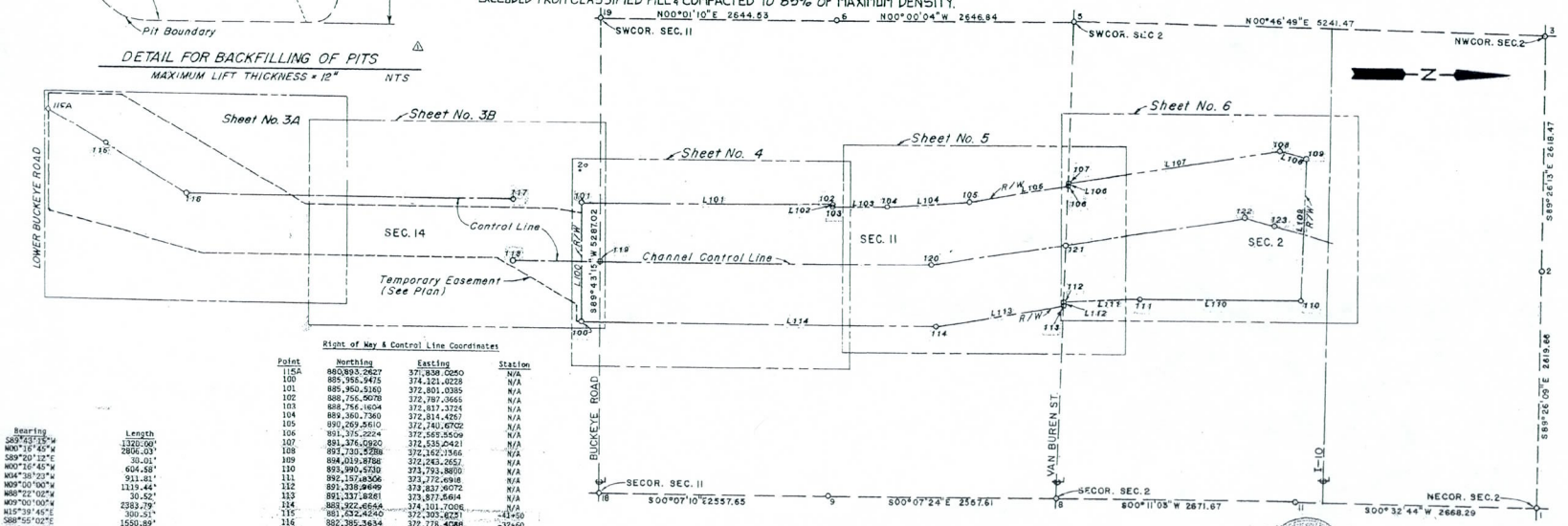
Basis of Bearings: Line from Northwest corner Section 2 to N 1/4 corner Section 2
= S 89° 36' 13" E

Channel control line is not always the channel centerline.

In case of conflict in elevation data, information shown on profiles (sheets 7-10) governs.

① CLASSIFIED FILL: MAT'L EXCAVATED FROM PROJECT LIMITS WHICH IS FREE OF DEBRIS ROOTS, TREES, TRASH OR OTHER OBJECTIONABLE MATTER. FILL TO BE COMPACTED TO 95% OF MAXIMUM DENSITY.

② UNCLASSIFIED FILL: MAT'L EXCAVATED FROM PROJECT WHICH MAY CONTAIN MATTER EXCLUDED FROM CLASSIFIED FILL & COMPACTED TO 85% OF MAXIMUM DENSITY.



HORIZONTAL CONTROL MAP

See Sheets 4-6 For Vertical Control

Scale: 1"= 600'

Right of Way & Control Line Coordinates

Point	Northing	Easting	Station
115A	880893.2427	377,838.0050	N/A
100	885,956.9475	374,121.0228	N/A
101	885,950.5180	372,801.0385	N/A
102	888,756.5678	372,787.3665	N/A
103	888,756.1604	372,817.3724	N/A
104	889,360.7360	372,814.4267	N/A
105	890,269.5610	372,740.6702	N/A
106	891,375.2224	372,569.5509	N/A
107	891,376.0920	372,535.0421	N/A
108	893,730.5288	372,162.1566	N/A
109	894,019.8788	372,243.2657	N/A
110	893,990.5730	373,793.8800	N/A
111	892,157.6408	373,272.6918	N/A
112	891,338.9649	373,837.9072	N/A
113	891,337.8281	373,877.5614	N/A
114	883,322.6644	374,101.7006	N/A
115	881,632.4240	372,303.6251	-43+50
116	882,385.3634	372,778.4088	-32+60
117	885,145.3306	372,764.9612	-5+00
118	885,148.7415	373,464.9528	-5+00
119	886,148.7288	373,465.0805	5+00
120	889,869.1000	373,441.9533	42+20.41
121	891,355.9692	373,206.3000	57+26.81
122	893,371.7979	372,882.1015	77+56.77
123	893,564.2862	372,946.7592	79+87.45

Line	Bearing	Length
L100	S89°43'15"W	1320.00'
L101	N00°16'45"W	2806.03'
L102	S89°20'12"E	30.01'
L103	N00°16'45"W	604.58'
L104	N14°38'23"W	911.81'
L105	N09°00'00"W	1319.44'
L106	N66°22'02"W	30.52'
L107	N09°00'00"W	2383.79'
L108	N15°39'45"E	300.51'
L109	S88°55'02"E	1550.89'
L110	S00°39'45"W	1832.86'
L111	S04°31'57"E	821.43'
L112	S88°22'02"E	39.97'
L113	S09°00'00"E	1432.80'
L114	S00°16'45"E	3965.76'

RECORD DRAWING

PROJECT ENGINEER DATE

263-H00

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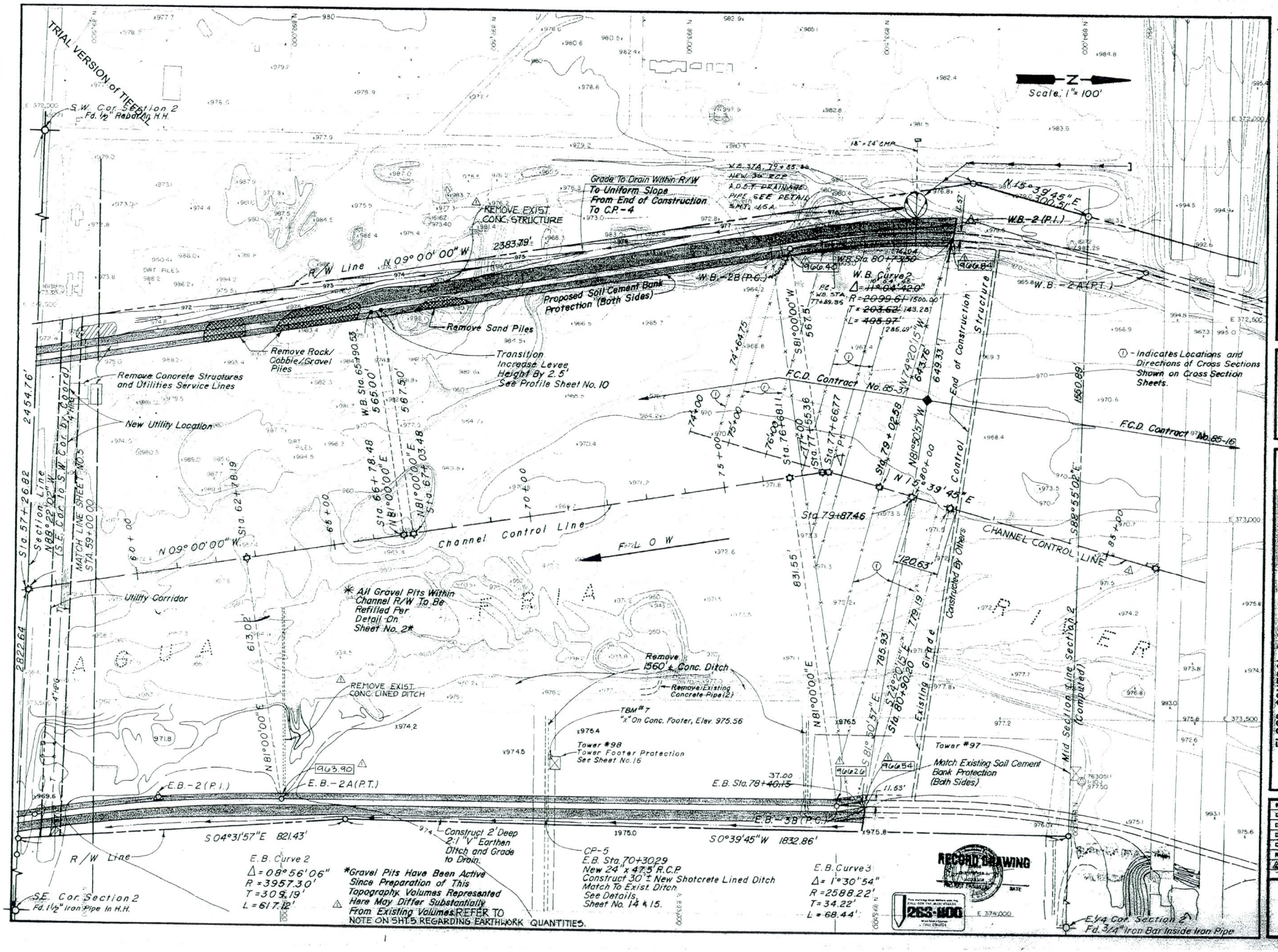
AGUA FRIA RIVER IMPROVEMENTS

BUCKEYE ROAD TO I-10

Project No.	PAZ-MC-09
Date:	2/85
Design:	RAM
Drawn:	GD/EB
Check:	JBL
Revisions:	⚠ 9-18-86
	⚠ 1-15-87 by Western
Technalysis, Inc.	

2/53



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Date:	2/'85
Design:	RAM
Drawn:	GD/EB
Check:	JBL/ARLW
Revisions:	9-M-86
	1-15-87 by Western Technologies, Inc.

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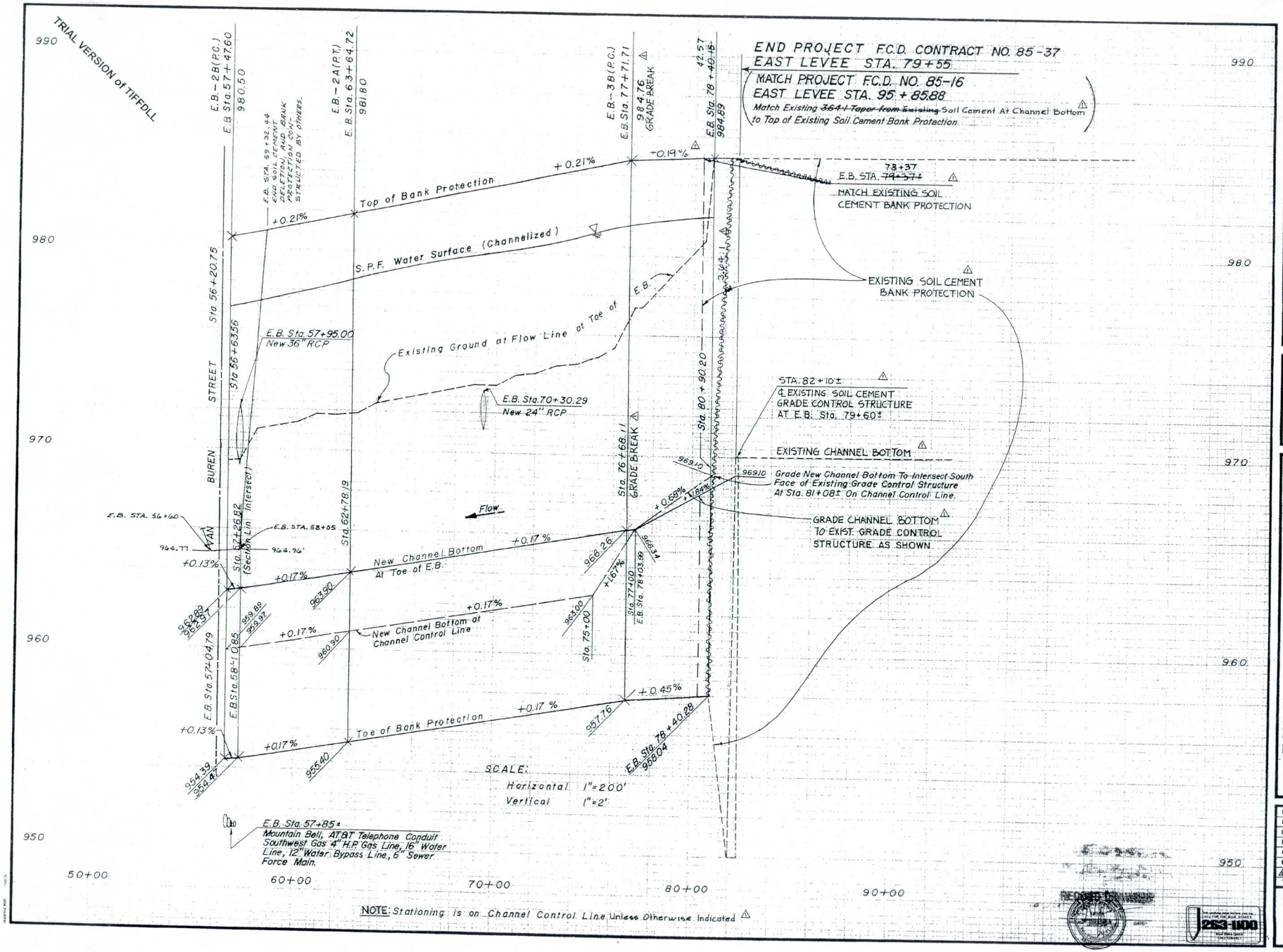

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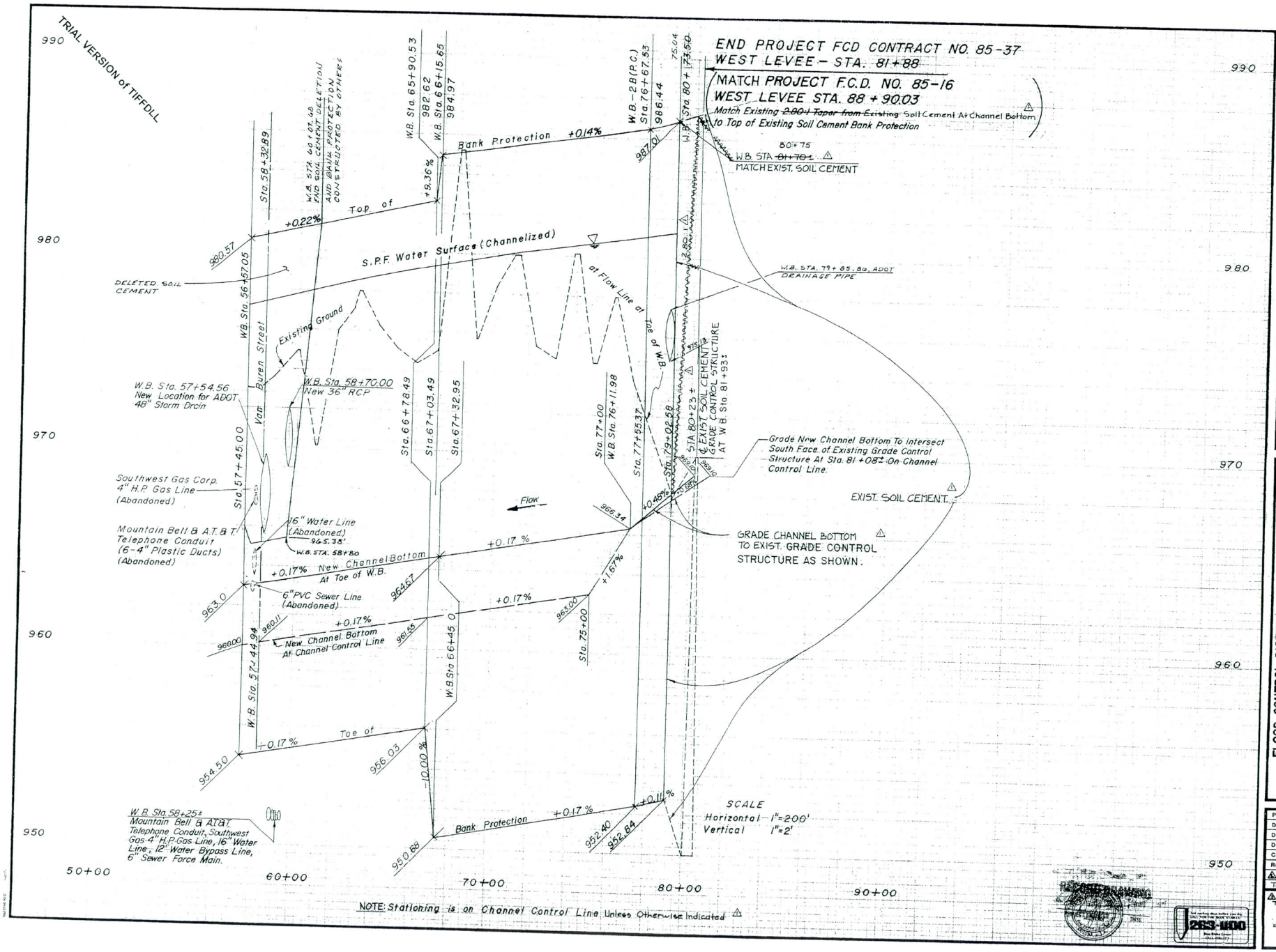
Drawn:	GD/EB
Check:	JBL/RLW
Revisions:	9-19-86
	1-15-87 by Western Technologies, Inc.

8/53



Simons, Li & Associates, Inc.
Cheyenne, WY. • Colorado Springs, CO. • Denver, CO. • Fort Collins, CO.
Newport Beach, CA. • Pittsburgh, PA. • Salt Lake City, UT. • Tucson, AZ. • Washington, D.C.

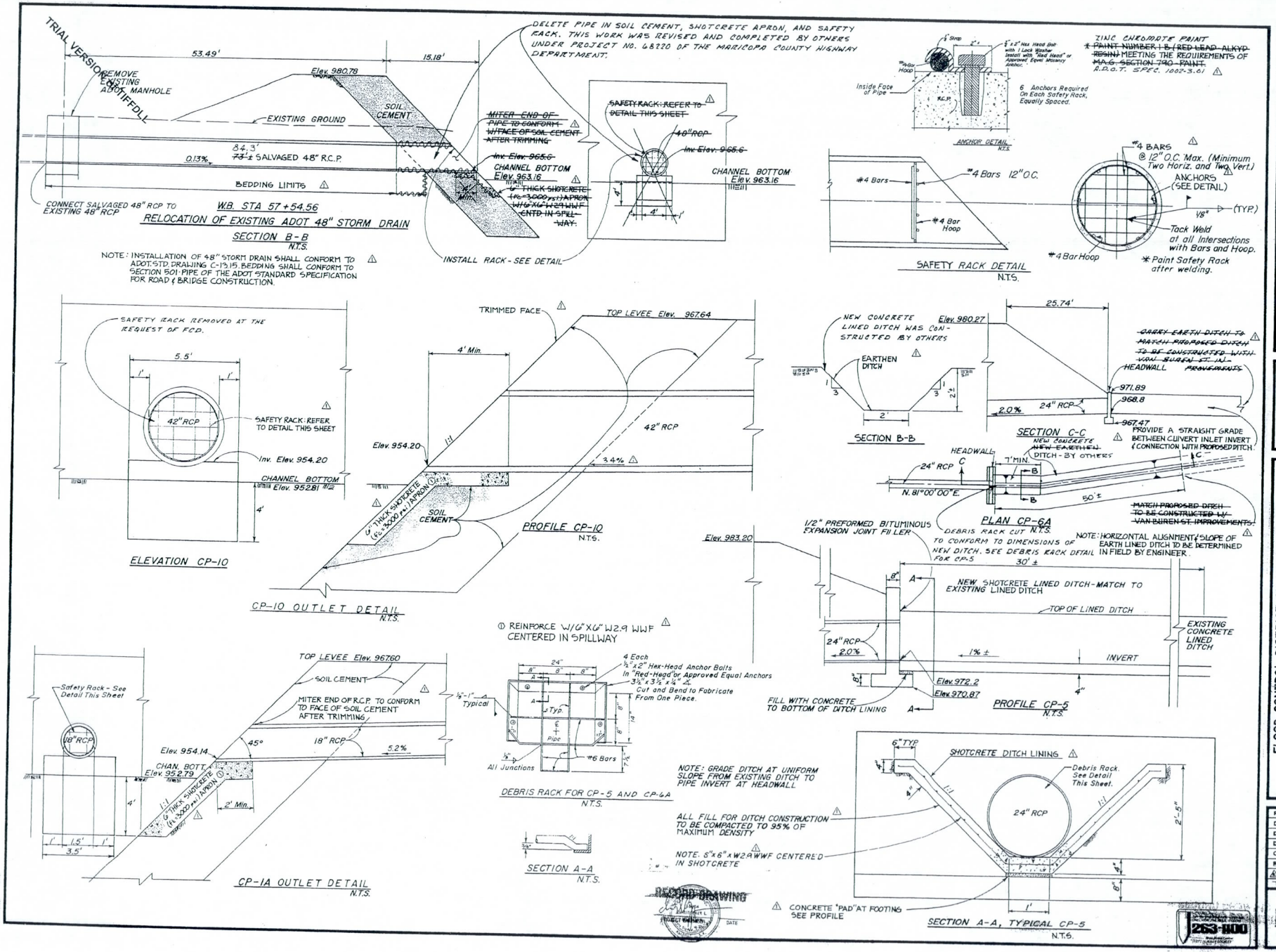
FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street - Phoenix Arizona 85009 - TEL 602-262-1501

AQUA FRIA RIVER IMPROVEMENTS

BUCKEYE ROAD TO I-10

Project No.	PAZ-MC-09
Date:	2/85
Design:	RAM
Drawn:	GD/EB
Check:	JBL/RLW
Revisions:	9-19-86
	1-15-87 by Western Technologies, Inc
	1-30-87 by Western Technologies, Inc

10/53



Simons, Li & Associates, Inc.
Cheyenne, WY. • Colorado Springs, CO. • Denver, CO. • Fort Collins, CO.
Newport Beach, CA. • Pittsburgh, PA. • Salt Lake City, UT. • Tucson, AZ. • Washington, D.C.

FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street - Phoenix, Arizona 85009 - Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS

BUCKEYE ROAD TO I-10

Project No.	PAZ-MC-09
Date:	2/85
Design:	R.A.M.
Drawn:	T.R.
Check:	J.B.L. / R.L.W.
Revisions:	∆ 9-23-86
	∆ 1-14-87 by Western Technologies, Inc.

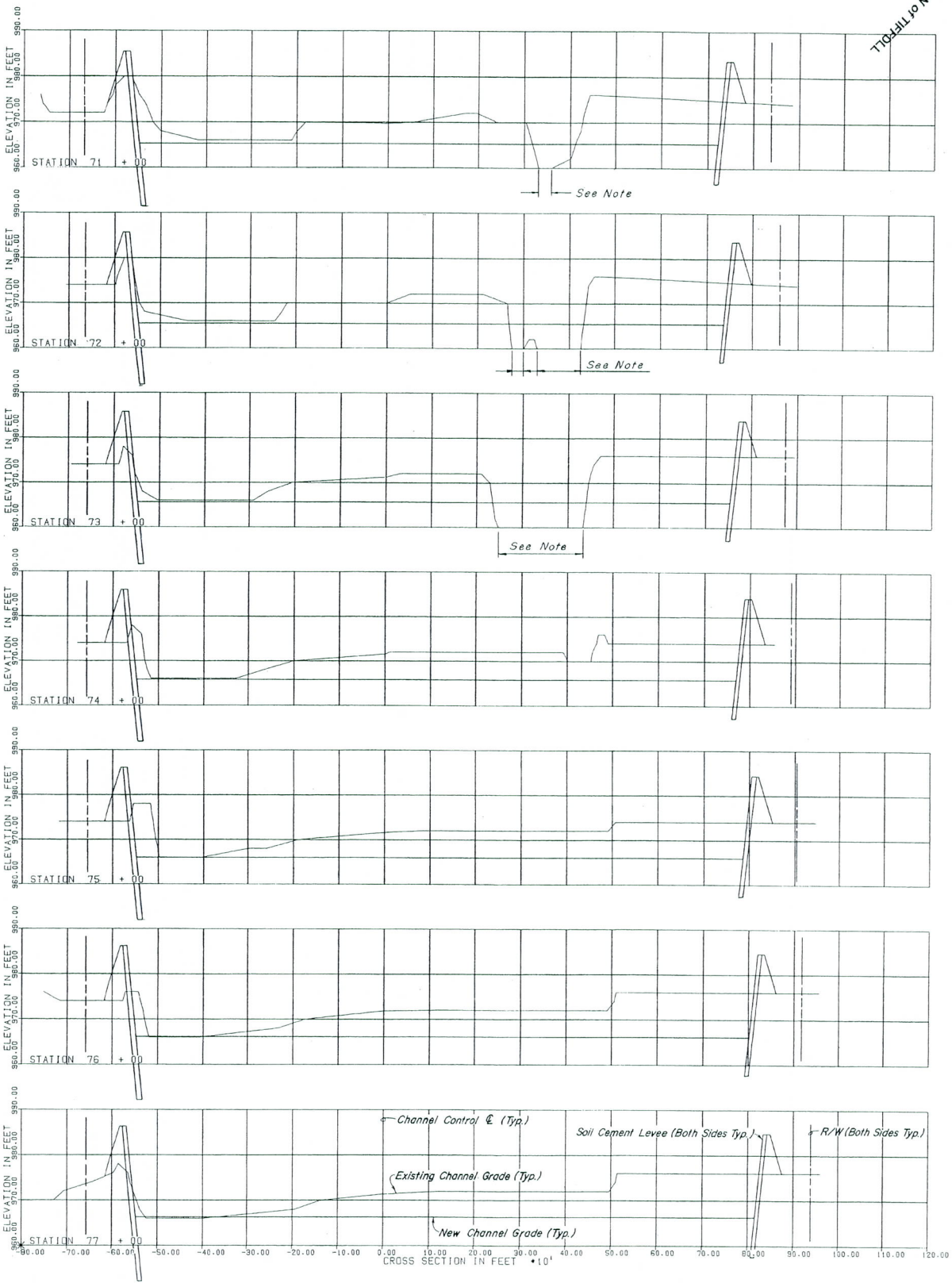
15/53

Note:
Existing Gravel Pit Profile Not Shown
See Topo - Plan Sheets For Approx. Depths

TRIAL VERSION 6/TIFFOLL

CHANNEL CROSS SECTIONS

SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'



30/32

Project No.	PAZ-MC-09
Date:	2/95
Design:	RAM
Drawn:	GDVEB
Check:	JRL/RLW
Revisions:	

FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street · Phoenix Arizona 85009 · Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS

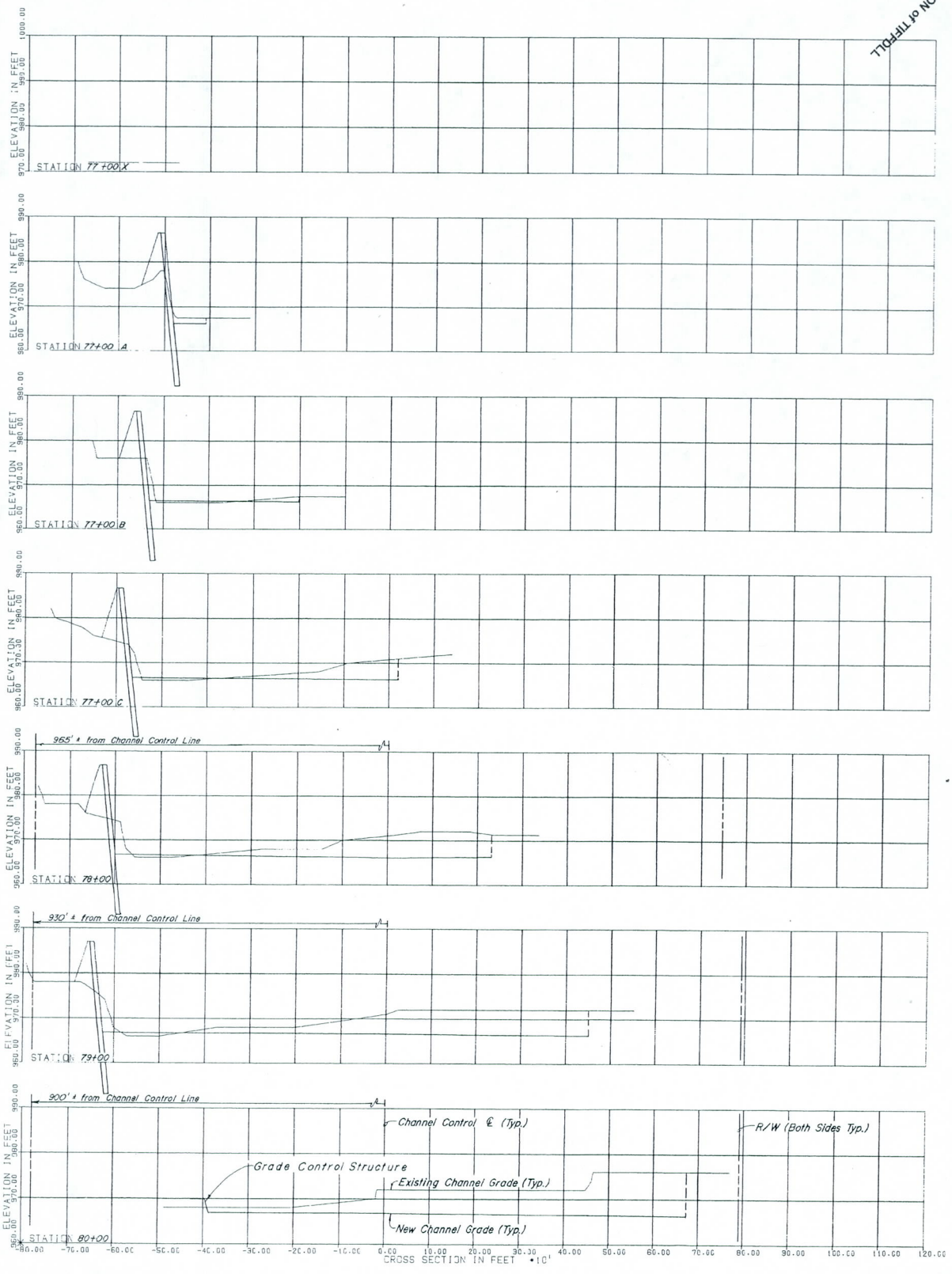
BUCKEYE ROAD TO I-10

SIMONS, LI & ASSOCIATES, INC.
Cheyenne, WY. • Colorado Springs, CO. • Denver, CO. • Fort Collins, CO.
Newport Beach, CA. • Pittsburgh, PA. • Salt Lake City, UT. • Tucson, AZ. • Washington, D.C.

TRIAL VERSION of TIFFOLL

CHANNEL CROSS SECTIONS

SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'



31/32

Project No. PAZ-MC-09
Date: 2/85
Design: RAM
Drawn: GD/EB
Check: JBL/TRLW
Revisions:

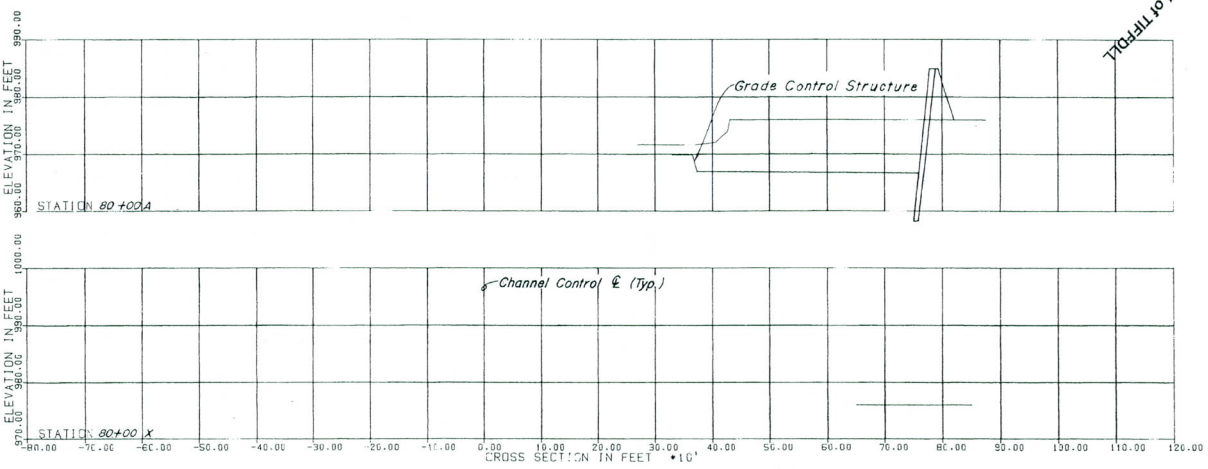
FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street · Phoenix Arizona 85009 · Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS

BUCKEYE ROAD TO I-10

sla SIMONS, LI & ASSOCIATES, INC.
Cheyenne, WY. • Colorado Springs, CO. • Denver, CO. • Fort Collins, CO.
Newport Beach, CA. • Pittsburgh, PA. • Salt Lake City, UT. • Tucson, AZ. • Washington, D.C.

TRIAL VERSION OF TIFFDLL



CHANNEL CROSS SECTIONS

SCALE: HORIZ. 1"=100'
VERT. 1"=10'

32/32

Project No.	PAZ-MC-09
Date:	2/85
Design:	RAM
Drawn:	GD/EB
Check:	JBL/RLW
Revisions:	

FLOOD CONTROL DISTRICT OF MARICOPA CO.
3335 West Durango Street · Phoenix, Arizona 85009 · Tel. 602-262-1501

AGUA FRIA RIVER IMPROVEMENTS

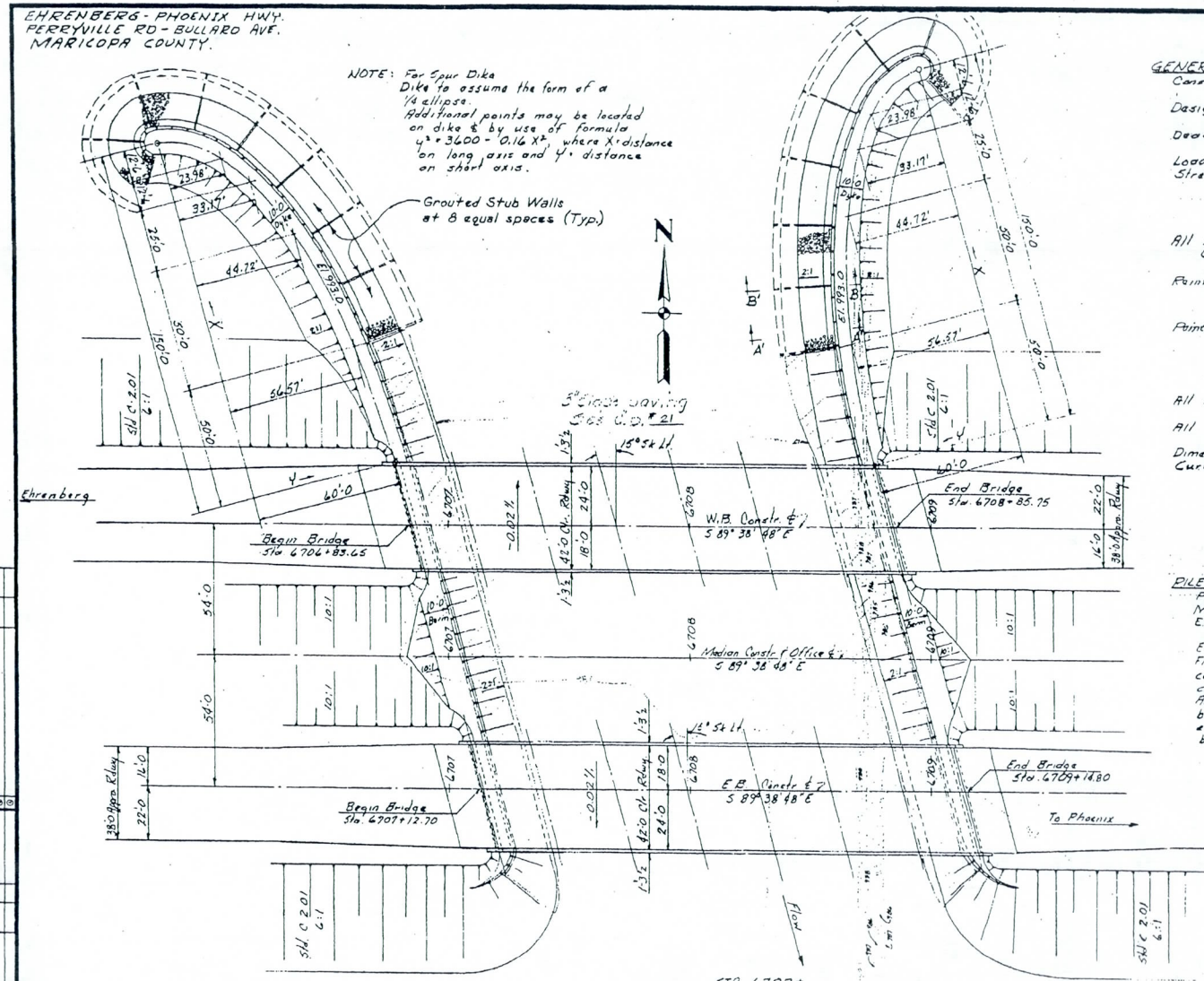
BUCKEYE ROAD TO I-10

sla SIMONS, LI & ASSOCIATES, INC.
Cheyenne, WY. • Colorado Springs, CO. • Denver, CO. • Fort Collins, CO.
Newport Beach, CA. • Pittsburgh, PA. • Salt Lake City, UT. • Tucson, AZ. • Washington, D.C.

EHRENBERG - PHOENIX HWY.
PERRYVILLE RD - BULLARD AVE.
MARICOPA COUNTY.

FED. AID PROJ. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
8	ARIZONA	I-10-2(34)	152	164	6-15-79 A.A. by E.G.D. 10-85

NOTE: For Spur Dike
Dike to assume the form of a ¼ ellipse.
Additional points may be located on dike ℄ by use of formula $Y^2 = 3600 - 0.16X^2$, where X = distance on long axis and Y = distance on short axis.



STA. 6707+ LOCATION PLAN
2 New 7 Span Continuous C.I.P. Concrete Slab Bridges, Skew 15° Lt.
Contour Intervals = 1'
scale ~ 1" = 20'

GENERAL NOTES~
Construction ~ Std. Specs. Ariz. Hwy Dept. Edition of 1969, revised to date.
Design ~ AASHTO Std Specs for Hwy Bridges 1973, revised to date.
Dead Load ~ Dead load includes allowance of 25 pounds per square foot for future wearing surface.
Loading Class ~ MS 20-44 and/or Interstate Alternate Loading.
Stresses ~ Class A Concrete f_c = 1000 psi
Class D Concrete f_c = 1200 psi
Structural Steel f_s = 20,000 psi
Gr. 40 Reinf. Steel f_s = 20,000 psi
Gr. 60 Reinf. Steel f_s = 24000 psi
All superstructure concrete except curbs & parapets shall be Class D. All other concrete including curbs & parapets shall be Class 'A'.
Reinforcing Steel shall conform to ASTM Spec. A 615. Bar sizes #7 and smaller shall be Grade 40. Bar sizes #8 and larger shall be Grade 60.
Paint & painting shall conform to Std Specs.
Contact surfaces shall not be painted
Structural Steel: Shop 1 coat paint #1A or #1B #3 & #10
Exposed area of piles shall be painted in accordance with Std. Spec. 517-3.08
All reinforcing steel dimensions shall be to center of bars unless noted otherwise.
All reinforcing steel shall have 2" clear cover unless noted otherwise.
Dimensions shall not be scaled from drawings.
Curbs or parapets shall be constructed after spans have taken slab dead load deflection.

PILE NOTE~
Piles shall be HP or MPS 10x42. Pile steel shall conform to ASTM A-36
Minimum bearing shall be 45 tons.
Estimated pile tip elevation shall be 969.0 typ. at all apuments and all piers.
Estimated length 35.0' typical for all piles.
Fill shall be built to top of berm or pile elevation and compacted before piles are driven. Excavation for abutment concrete shall be made after piles are in place.
Any pile which is driven to a bearing of 1¼ times the bearing given on the plans and which reaches a tip elevation within 3' of the estimated tip elevation shall be considered acceptable.

See Sh 2 of 9 for Sect A'-A', B'-B', & Approximate Quantities.

BRIDGE BRANCH
AS BUILT
COMPLETION DATE 6-15-79 AA

		DATE
LAYOUT	T.D.S.	9-75
DESIGN	S.S.W.	10-75
DESIGN CK'D		
DRAWN	[illegible]	9-75
DWG CK'D	[illegible]	"
APPROVED	[illegible]	3/76

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6707+ E.B. & W.B. AIRPORT WASH BRIDGE
LOCATION PLAN

SHEET NO.	OF	ROUTE	COUNTY	FED. AID NO.	STATE PROJECT NO.	PROJECT NO.
1	9	I-10	Maricopa	FR 7838 NB 1850	I-10-2(34)	

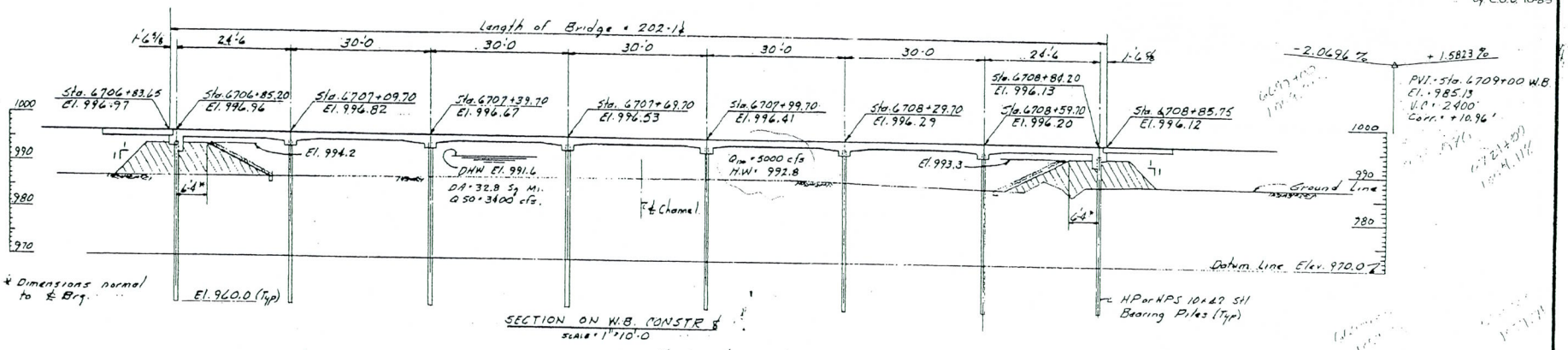
BRIDGE ENGINEER

MP 127.15

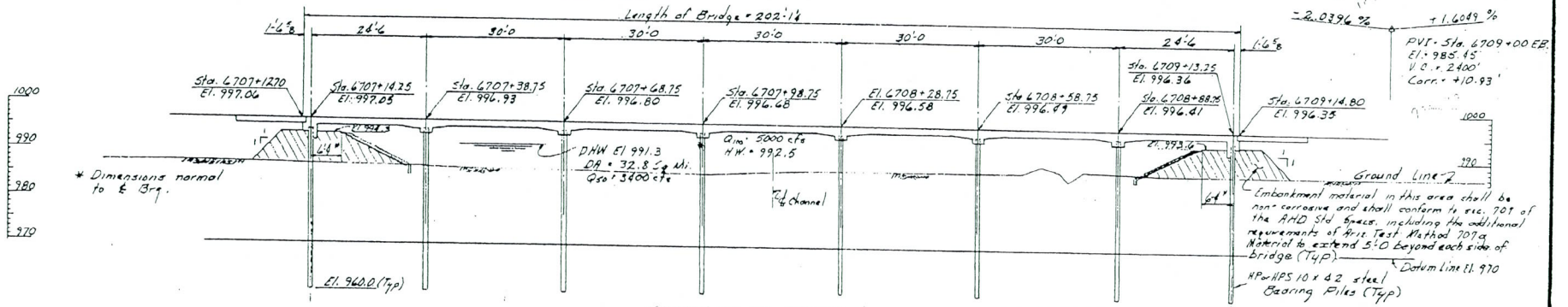
M-18-7.163

EHRENBERG - PHOENIX HWY.
PERRYVILLE RD - BULLARD AVE.
MARICOPA COUNTY.

FED. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2 (34)	163	164	6-15-77 A.A. by E.G.D. 10-85



SECTION ON W.B. CONSTR ℄
SCALE: 1" = 10'-0



SECTION ON E.B. CONSTR ℄
SCALE: 1" = 10'-0

APPROXIMATE QUANTITIES

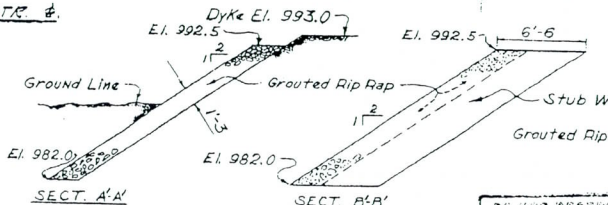
EASTBOUND

Item	Struct. Excav. C.Y.	Spec. Bkfl. C.Y.	Concrete Cl. A C.Y.	Concrete Cl. D C.Y.	Steel Reinf. Lbs.	Stl. Piling HP or NPS No.	Stl. Piling HP or NPS Lin. Ft.	H-2-1 Handrail Lin. Ft.
Abut #1	~~155~~ 153	~~55~~ 42	~~28~~ 29	~~13.50~~ 13.50	~~2540~~ 2540	7	245	
Piers #1 thru 6			~~2.39~~ 2.39	~~15.7~~ 15.51	~~3225~~ 2225	60	2108	
Abut #2	~~153~~ 153	~~50~~ 42	~~2.39~~ 2.39	~~13.50~~ 13.50	~~2540~~ 2540	7	245	
Deck			12.00	~~164.90~~ 164.90	116,240			303.67
Appro. Slabs			~~49.50~~ 49.50	~~49.85~~ 49.85	~~7,555~~ 7,555			
		BA	~~46.47~~ 46.47					
Total	~~308~~ 308	~~105~~ 105	~~66.28~~ 66.28	~~496.20~~ 496.20	128,925	74	2598	303.67

WESTBOUND

Item	Struct. Excav. C.Y.	Spec. Bkfl. C.Y.	Concrete Cl. A C.Y.	Concrete Cl. D C.Y.	Steel Reinf Lbs.	Stl. Piling HP or NPS Nº	Stl. Piling HP or NPS Lin. Ft.	H-2-1 Hdrl. Lin. Ft.
Abut #1	~~153~~ 153	~~53~~ 42	2.39	~~13.50~~ 13.50	2,540	7	245	
Piers #1 thru 6				~~15.51~~ 15.51	~~2225~~ 2225	~~60~~ 60	~~350 ea~~	
Abut #2	~~153~~ 153	~~53~~ 53	2.39	~~13.50~~ 13.50	~~2,540~~ 2,540	7	245	
Deck			12.00	~~164.90~~ 164.90	116,240			303.67
Appro. Slabs			~~49.50~~ 49.50	~~48.30~~ 48.30	~~7,555~~ 7,555			
		84			45			
Total	~~306~~ 306	137	~~66.28~~ 66.28	~~496.10~~ 496.10	128,925	72	~~2590~~ 2590	303.67

Rip-Rap (grouted) = ~~500~~ 440 C.Y. total for two bridges.
Dyke (EB & WB) = 1690 c.y.



		DATE
LAYOUT	T.D.S.	9-75
DESIGN	C.K.W.	9-75
DESIGN CHKD		
DRAWN	W.R.S.	9-75
CHECKED	C.K.W.	9-75
APPROVED	[illegible]	6-76
SHEET NO.	2 9 OF	

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6707+EB & WB.
AIRPORT WASH BRIDGE
LOCATION SECTIONS

I-10	Maricopa	62 1839
ROUTE	COUNTY	STRUCTURE NO.
	WB 1860	I-10-2 (34)
		PROJECT NUMBER

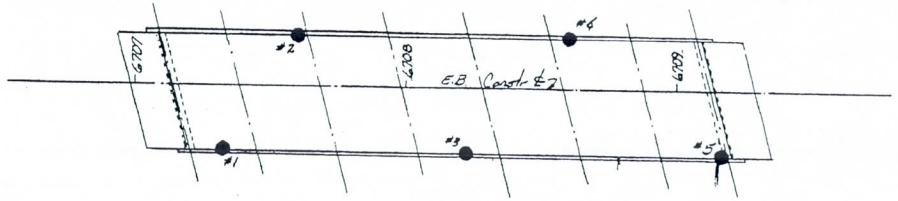
BRIDGE ENGINEER

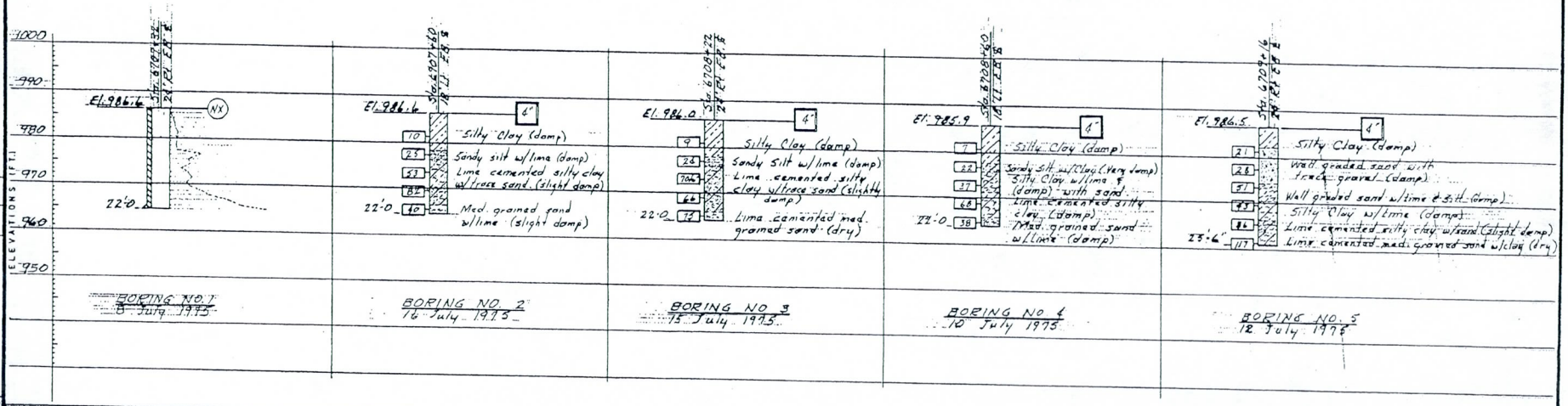
M-18.7163

EHRENBERG - PHOENIX HWY.
PERRYVILLE RD - BULLARD AVE.
MARICOPA COUNTY.

STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
ARIZONA	I-10-2(34)	134	164	2-15-79 AA

by EGD 10-85





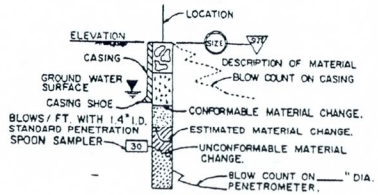
REVISION — REDRAWN
WEB 5-75

LEGEND OF SOIL SYMBOLS

- COBBLES OR BOULDERS
- GRAVEL
- SAND
- SILT
- CLAY
- VOLCANIC CINDERS, ASH OR TUFF
- LIME
- FILL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- NX CASING
- ___" DIA. PENETROMETER
- AUGER BORING (DRY)
- ___" DIA. BLUE DEMON ROTARY BORING (WET)
- AX CORE BORING (WET)
- ___" DIA. TRICONE ROTARY BORING (WET)
- TEST PIT



NOTES

INFORMATION CONTAINED ON THIS SHEET IS MADE AVAILABLE TO PROSPECTIVE BIDDERS FOR INFORMATION PURPOSES ONLY AND IS NOT TO BE CONSIDERED A PART OF THE CONTRACT PAPERS. CLASSIFICATION OF MATERIALS IS IN ACCORDANCE WITH AASHTO "MANUAL ON FOUNDATION INVESTIGATIONS." CLASSIFICATION OF EARTH MATERIALS IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS. THE ABSENCE OF A GROUND WATER INDICATION DOES NOT CONSTITUTE A REPRESENTATION THAT THE GROUND WATER WILL NOT BE PRESENT DURING CONSTRUCTION. GROUND WATER IS INDICATED HEREIN ONLY WHEN FOUND DURING THE FOUNDATION INVESTIGATON AND REPRESENTS THAT CONDITION ONLY ON THE DATE OF THE INVESTIGATION. INFORMATION IS DEVELOPED AS ACCURATELY AS FOSSIBLE BY THE METHODS UTILIZED. HOWEVER, THE STATE ACCEPTS NO RESPONSIBILITY FOR ANY CONDITIONS ENCOUNTERED WHICH MAY BE AT VARIANCE FROM INFORMATION CONTAINED HEREIN. NX CASING AND THE 3" DIA PENETROMETER ARE DRIVEN WITH 342 POUND HAMMER, WITH 30" FREE FALL, NO CUSHION. STANDARD PENETRATION SPOON SAMPLER AND THE 2" DIAMETER PENETROMETER ARE DRIVEN WITH 140 POUND HAMMER, WITH 30" FREE FALL, NO CUSHION.

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN		
DESIGN CK'D		
DRAWN	WJP	7-75
CHECK'D	K MH	7-75
APPROVED	[signature]	7-76

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6707+ E.B. AIRPORT WASH BRIDGE
FOUNDATION DATA SHEET

SHEET NO. 3 OF 9 SHEETS | I-10 ROUTE NO. | 1869 PROJECT NO. | I-10-2(34) PROJECT NUMBER

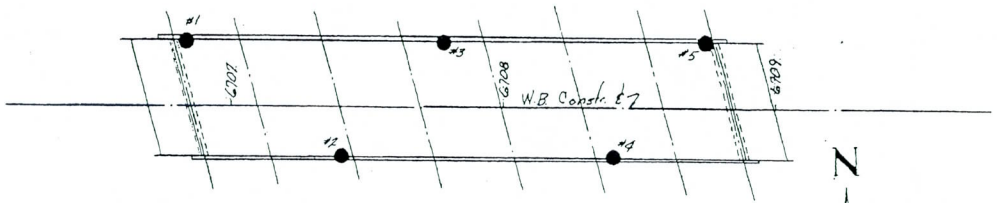
MP 129.13

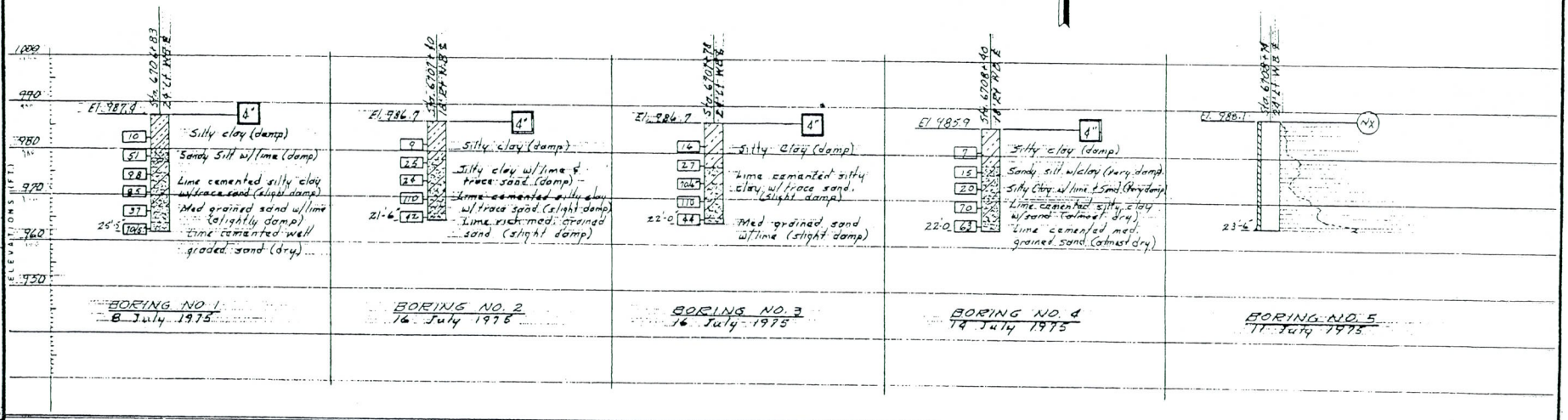
11.87.163

EHRENBERG-PHOENIX HWY
PERRYVILLE RD-BULLARD AVE
MARICOPA COUNTY.

	I-10-2(34)	165	164	6-15-79	A.A.

by E.G.D. 10:85





REVISION — REDRAWN

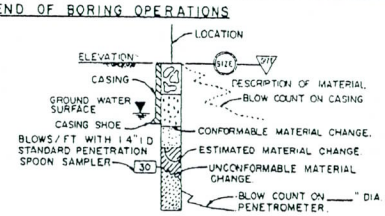
WEB S-75

LEGEND OF SOIL SYMBOLS

- COBBLES OR BOULDERS
- GRAVEL
- SAND
- SILT
- CLAY
- VOLCANIC CINDERS, ASH OR TUFF
- LIME
- FILL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- NX CASING
- ___" DIA. PENETROMETER
- AUGER BORING (DRY)
- ___" DIA BLUE DEMON ROTARY BORING (WET)
- AX CORE BORING (WET)
- ___" DIA. TRICONE ROTARY BORING (WET)
- TEST PIT



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U.S. ROUTE 80 STATE

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA 6707+ W.B.
AIRPORT WASH BRIDGE
FOUNDATION DATA SHEET

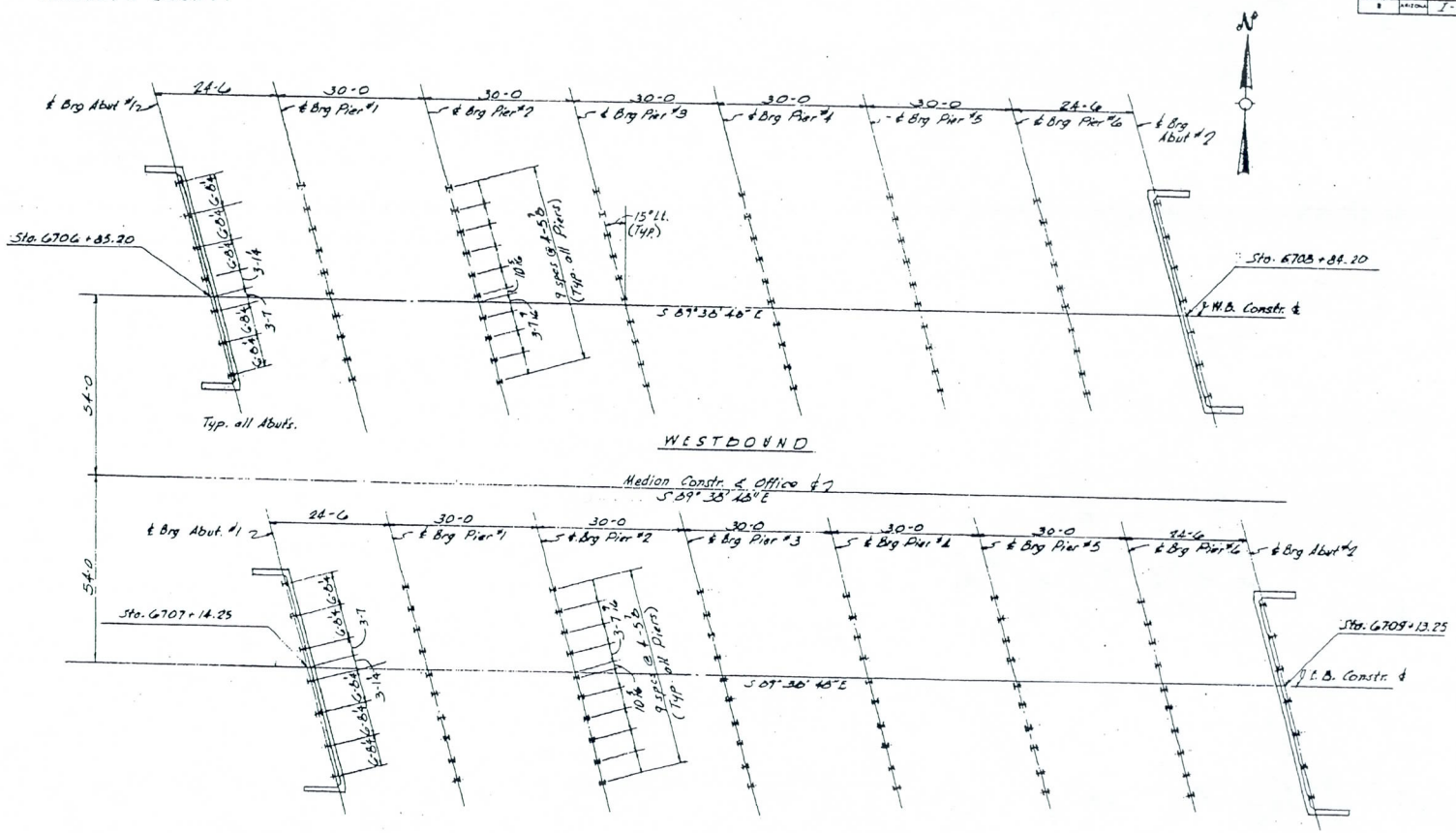
DESIGNED					
DRAWN	WRS	7-79			
CHECKED	KMM	7-79			
APPROVED					
4	9	I-10	Maricopa	1850	I-10-2(34)

M-18.7.163

EHRENBERG – PHOENIX HWY
PERRYVILLE – BULLARD AVE
MARICOPA COUNTY

REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
8	ARIZONA	I-10-2(34)	156	164	6-18-79

A.A. by E.G.D. 10-85



DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	C O W	11-78
DESIGN CH'D		
DRAWN	AA	11-78
REQ'D	E.E.-/-	1-79
APPROVED	[illegible]	2-79
SHEET NO. 5 OF 9	I-10 / Maricopa / #B-1849 W.B.-1850	I-10-2(34)
	ROUTE / COUNTY	PROJECT NUMBER

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

Sta. 6707+ E.B. & W.B.
AIRPORT WASH BRIDGE
FOOTING LAYOUT

BRIDGE ENGINEER

mp 127.15

M-18.7163

EHRENBERG - PHOENIX HWY
PERRYVILLE - BULLARD AVE.
MARICOPA COUNTY

I-10-2(34)	156	164	6-15-79	A.A. by E.G.D. 10-85

Pile number	Abutment #1							Pier #1										Pier #2						
Pile number	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
Elevation top of pile	995.58	995.45	995.32	995.19 (?)	995.06	994.93	994.80	995.78	995.68	995.60	995.51	995.42	995.33	995.24	995.15	995.04	994.97	995.65	995.56	995.47	995.38	995.29	995.20	995.11
Length of stroke in ft (diesel)																								
Average penetration -s in.	.300	.225	.275	~~.325~~	.300	.325	.300	.250	.225	.200	.325	.325	.300	.275	.275	.325	.225	.250	.150	.175	.225	.150	.275	.300
Safe bearing - tons	48.75	60.00	52.00	~~45.88~~	48.75	45.88	48.75	55.71	60.00	65.00	45.88	45.88	48.75	52.00	52.00	45.88	60.00	55.71	78.00	70.91	60.00	78.00	52.00	65.00
Lin. ft. of each piece furnished	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	960.58	960.45	960.32	960.19	960.06	959.93	959.80	960.78	960.68	960.60	960.51	960.42	960.33	960.24	960.15	960.04	959.97	960.65	960.56	960.47	960.38	960.29	960.20	960.11

Pile number			Pier #3										Pier #4									
Pile number	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
Elevation top of pile	995.02	994.93	994.84	995.53	995.44	995.35	995.26	995.17	995.08	994.99	994.90	994.81	994.72	995.43	995.34	995.25	995.16	995.07	994.98	994.89	994.80	994.71	994.62
Length of stroke in ft.(diesel)																							
Average penetration -s in.	.225	.150	.175 (?)	.125	.200	.250	.225	.150	.175	.225	.175	.275	.250	.175	.150	.225	.150	.175	.225	.200	.200	.175	.150
Safe bearing - tons	60.00	78.00	70.91	86.67 (?)	65.00	55.71	60.00	78.00	70.91	60.00	70.91	52.00	55.71	70.91	78.00	60.00	78.00	70.91	60.00	65.00	65.00	70.91 (?)	78.00
Lin. ft. of each piece furnished	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	960.02	959.93	959.84	961.53 (?)	960.44	960.35	960.26	960.17	960.08	959.99	959.90	959.81	959.72	960.43	960.34	960.25	960.16	960.07	959.98	959.89	959.80	959.71	959.62

Pile number	Pier #5										Pier #6									
Pile number	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141
Elevation top of pile	995.34	995.25	995.16	995.07	994.98	994.89	994.80	994.71	994.62	994.53	995.26	995.17	995.08	994.99	994.90	994.81	994.72	994.63	994.54	994.45
Length of stroke in ft (diesel)																				
Average penetration -s in.	.250	.250	.150	.300	.300	.275	.200	.225	.300	.275	.325	.300	.325	.300	.275	.325	.275	.300	.325	.300
Safe bearing - tons	55.71	55.71	78.00	48.75	48.75	52.00	65.00	60.00	48.75	52.00	45.88	48.75	45.88	48.75	52.00	45.88	52.00	48.75	45.88	48.75
Lin. ft. of each piece furnished	35.00	35.00	2.40 35.00	10.00 35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	8.60 35.00	35.00	5.60 35.00	35.00	35.00	35.00
Elevation tip of pile	960.34	960.25	958.16	958.67	959.98	959.89	959.80	959.71	959.62	959.53	960.26	960.17	960.08	959.99	956.90	959.81	957.42 (?)	959.43 (?)	959.54	959.45

Pile number	Abutment #2						
Pile number	142	143	144	145	146	147	148
Elevation top of pile	994.89	994.76	994.63	994.50	994.37	994.24	994.11
Length of stroke in ft.(diesel)							
Average penetration -s in.	.275	.300	.325	.300	.275	.300	.300
Safe bearing - tons	52.00	48.75	45.88	48.75	52.00	48.75	48.75
Lin. ft. of each piece furnished	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	959.89	959.76	959.63	959.50	959.37	959.24	959.11

Pile number	
Elevation top of pile	
Length of stroke in ft (diesel)	
Average penetration -s in	
Safe bearing - tons	
Lin. ft. of each piece furnished	
Elevation tip of pile	

Pile number	
Elevation top of pile	
Length of stroke in ft.(diesel)	
Average penetration -s in.	
Safe bearing - tons	
Lin. ft. of each piece furnished	
Elevation tip of pile	

Tr 6(E)

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

Layout / Design / Architecture / Drawn AA / Traced / Checked

Sta. 6707+ E.B.
AIRPORT WASH BRIDGE
PILE RECORD

Sheet no. 5C-9 | Bridge number | Drawing number I-10-2(34) | Bridge Engineer

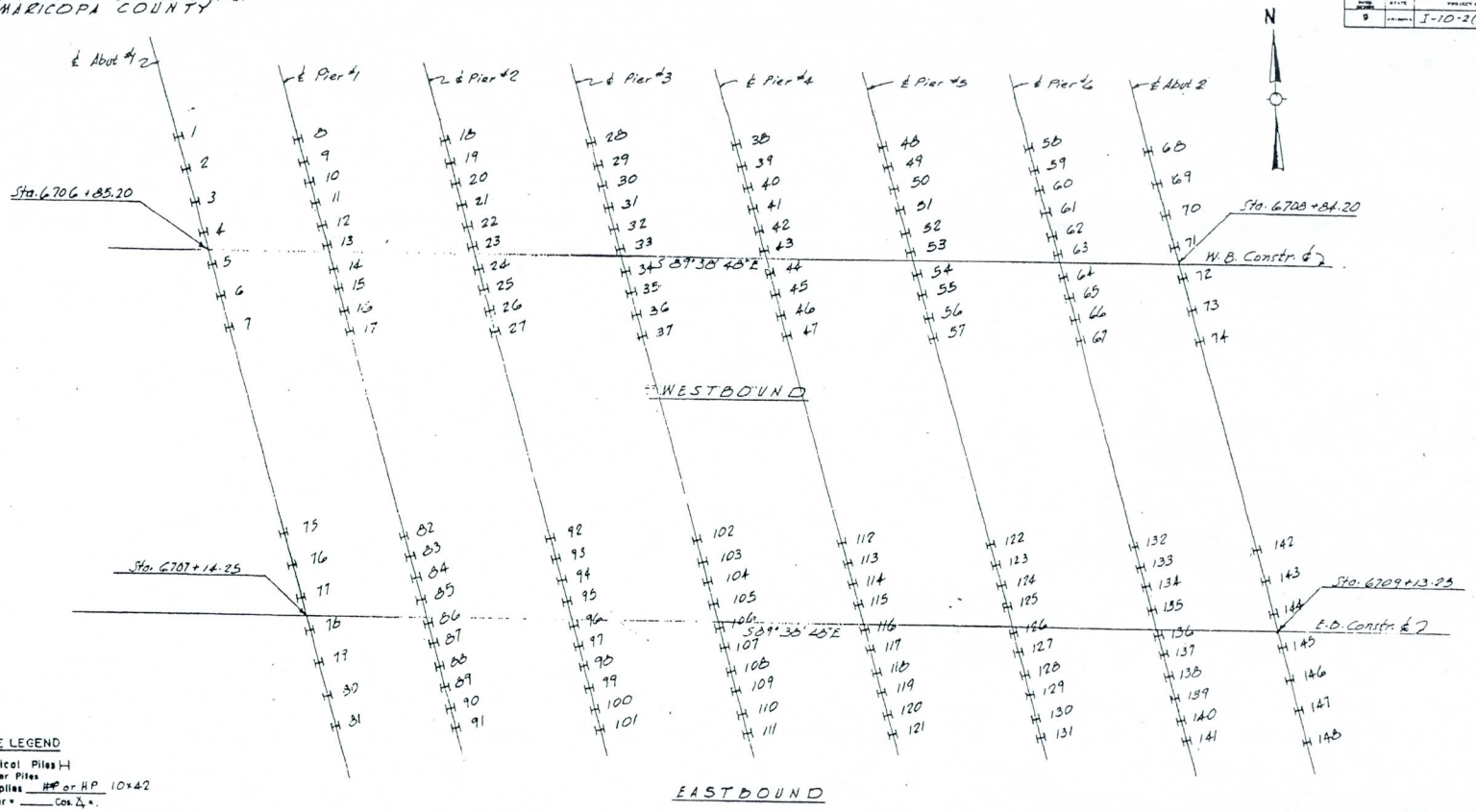
MP 127.15

M-18-7163

EHRENBERG – PHOENIX HWY
PERRYVILLE - BULLARD AVE.
MARICOPA COUNTY

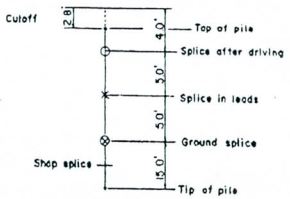
DIST.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(34)	1569	44	6-15-79

A.A.
by E.G.D. 10-85



PILE LEGEND

Vertical Piles H
Batter Piles
All piles HP or HP 10×42
Batter * ____ Cos. Δ *.



PILE LEGEND

CUTOFF LEGEND

12 "	Cutoff to stock pile.
10 "	Cutoff used in pile indicated. (Cutoff pile "10 used in pile "8)

HAMMER DATA

Type	VULCAN #06
Make	
Weight of ram	6,800 Lbs
Stroke	3 feet
Area of piston	
Effective cylinder pressure	

For single acting hammer

$$P = \frac{2WH}{s+0.1}$$

For double acting hammer

$$P = \frac{(W+ap)2H}{s+0.1}$$

P=Bearing capacity in pounds
W=Weight of ram in pounds
H=Length of stroke in feet
s=Average penetration per blow, in inches, of last 5 blows
a=Area of piston in square inches
p=Mean effective pressure in pounds per square inch in working cylinder

PAY QUANTITIES

ITEM	DESCRIPTION	UNIT	As Per Plan	As Built
512001	Furnishing Steel Piles	L.F.	5180	5275
512002	Driving " "	L.F.	5180	5275
512030	Splicing " "	each	74	10
512000	Furnishing " "	L.F.	—	15

* NON FA.

	DATE
LAYOUT	
DESIGN	
ARCHITECTURE	
DRAWN	
TRACED	
CHECKED	
SHEET NO. 5A-9	

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

Sta. 6707+14.25 L.B. & W.B.
AIRPORT WASH BRIDGE
PILE RECORD

1340 L.B. & W.S. | I-10-2(34)

MP 127.15

BRIDGE ENGINEER

M-18.7.163

MASTER

Tracing 2 (A)

EHRENBERG-PHOENIX HWY
PERRYVILLE-BULLARD AVE.
MARICOPA COUNTY

0		I-10-2(34)	156	164	6-15-79	A.A.

by E.G.D. 10-85

Pile number	Abutment #1							Pier #1											Pier #2						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Elevation top of pile	994.71	994.84	994.97	995.10	995.23	995.36	995.49	994.86	995.36	995.04	995.13	995.22	995.31	995.40	995.49	995.58	995.67	994.71	994.80	994.89	994.98	995.07	995.16	995.25
Length of stroke in ft.(diesel)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Average penetration –s in.	.225	.250	.275	.200	.225	.300	.250	.300	.150	.275	.275	.250	.325	.300	.300	.275	.325	.300	.275	.250	.275	.300	.325	.300
Safe bearing –tons	60.00	55.71	52.00	65.00	60.00	48.75	55.71	48.75	78.00	60.00	48.00	55.71	45.88	48.75	48.75	52.00	45.88	48.75	55.00	55.71	55.00	48.75	45.88	48.75
Lin. ft. of each piece furnished.	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	959.71	959.97	959.97	960.10	960.25	960.36	960.49	959.86	959.35	960.04	960.13	960.32	960.31	960.40	960.49	960.58	960.67	959.71	959.80	959.89	959.98	960.07	960.16	960.25

Pile number	Pier #3													Pier #4									
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Elevation top of pile	995.38	995.49	995.32	995.21	995.66	995.79	995.84	994.99	995.05	995.17	995.30	995.29	995.38	994.85	994.94	994.63	994.72	994.81	994.90	994.99	994.08	995.17	994.76
Length of stroke in ft.(diesel)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Average penetration –s in.	.325	.300	.275	.300	.275	.325	.300	.175	.225	.300	.200	.325	.250	.175	.225	.175	.150	.150	.150	.150	.275	.275	.325
Safe bearing –tons	45.88	48.75	52.00	48.75	52.00	45.88	48.75	70.91	60.00	48.75	65.00	45.88	55.71	70.91	60.00	70.91	78.00	78.00	78.00	78.00	52.00	52.00	45.88
Lin. ft. of each piece furnished.	35.00	35.00	35.00	1.00 35.00	1.40 35.00	35.00	1.90 35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	960.38	960.49	960.52	958.57	958.26	959.79	957.94	959.93	960.02	960.11	960.20	960.29	960.38	959.45	959.74	959.63	959.72	959.81	959.90	959.99	960.08	960.17	960.26

Pile number	Pier #5										Pier #6									
	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
Elevation top of pile	994.39	994.35	994.31	994.80	994.69	994.78	994.87	994.36	994.05	994.14	994.24	994.33	994.96	994.91	994.68	994.69	994.78	994.87	994.96	995.05
Length of stroke in ft (diesel)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	8.00 15.00	15.00	15.00	5.70 8.00 15.00	5.70 5.70 15.00	15.00
Average penetration –s in	.500	.175	.200	.175	.225	.275	.275	.325	.225	.300	.200	.250	.250	.300	.300	.250	.275	.300	.275	.300
Safe bearing –tons	69.00	70.91	65.00	70.91	60.00	55.00	55.00	45.88	48.75	48.75	65.00	55.71	55.71	48.75	48.75	56.71	52.00	48.75	58.00	48.75
Lin. ft. of each piece furnished	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	10.00 35.00	35.00	35.00	8.00 35.00	5.70 35.00	35.00
Elevation tip of pile	959.39	959.45	959.51	958.60	959.09	959.78	959.87	959.36	960.05	960.14	959.24	959.33	959.96	959.51	957.10	959.69	959.78	957.51	956.66	960.05

Pile number	Abutment #2						
	68	69	70	71	72	73	74
Elevation top of pile	993.88	994.01	994.14	994.27	994.40	994.53	994.66
Length of stroke in ft.(diesel)	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Average penetration –s in.	.175	.225	.250	.275	.250	.275	.200
Safe bearing –tons	70.91	60.00	55.71	52.00	55.71	52.00	65.00
Lin. ft. of each piece furnished.	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Elevation tip of pile	958.88	959.01	959.14	958.27	959.40	959.53	959.66

Pile number																								
Elevation top of pile																								
Length of stroke in ft (diesel)																								
Average penetration –s in																								
Safe bearing –tons																								
Lin. ft of each piece furnished																								
Elevation tip of pile																								

Pile number																								
Elevation top of pile																								
Length of stroke in ft(diesel)																								
Average penetration –s in.																								
Safe bearing –tons																								
Lin. ft. of each piece furnished																								
Elevation tip of pile																								

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA. 6707+ W.B.
AIRPORT WASH BRIDGE
PILE RECORD

I-10-2(34)

SHEET NO. 58 OF 9 SHEETS

BRIDGE ENGINEER

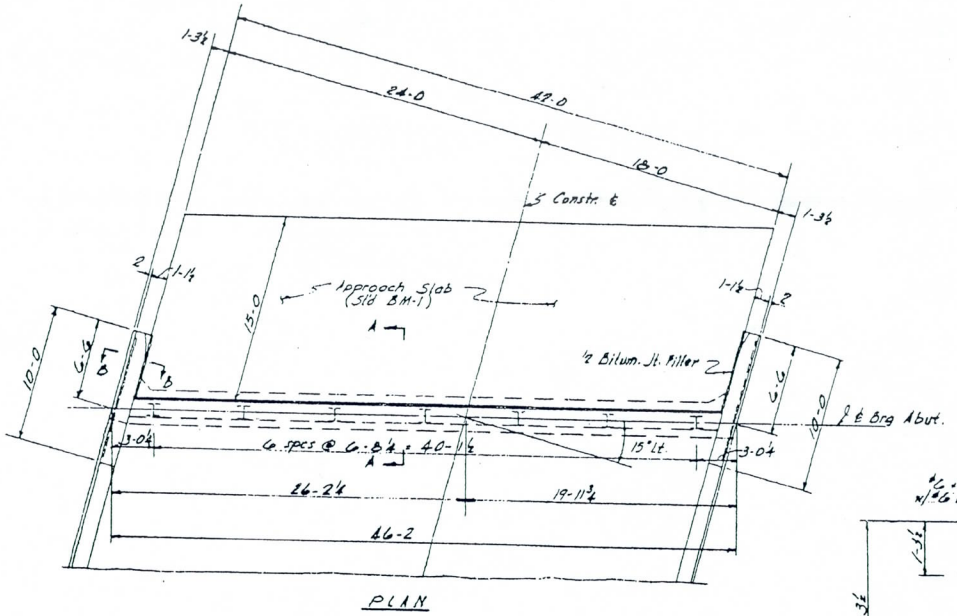
MP 127.15

M 10.7.163

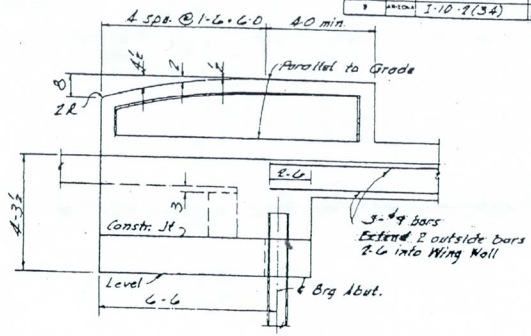
EHRENBERG - PHOENIX HWY
PEARYVILLE RD - BULLARD AVE
MARICOPA COUNTY

TYPE SECTION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHTS.	SCALE	DATE
9	ARIZONA	I-10-7(34)	157	164	6-15-79	A.A.

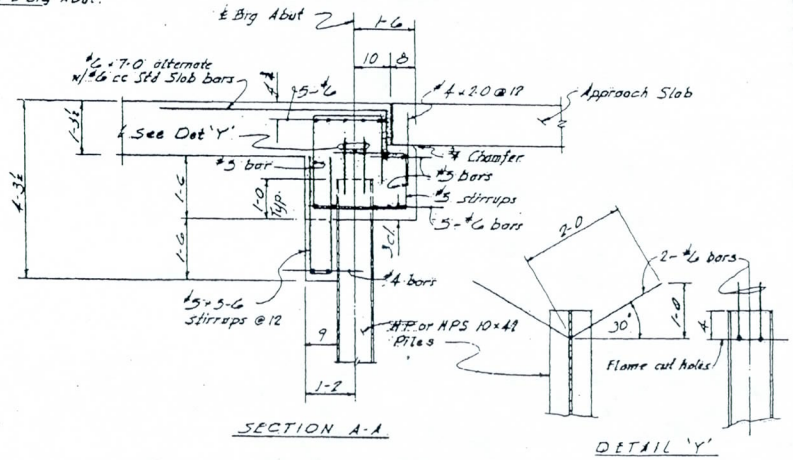
by E.G.D. 10-85



PLAN

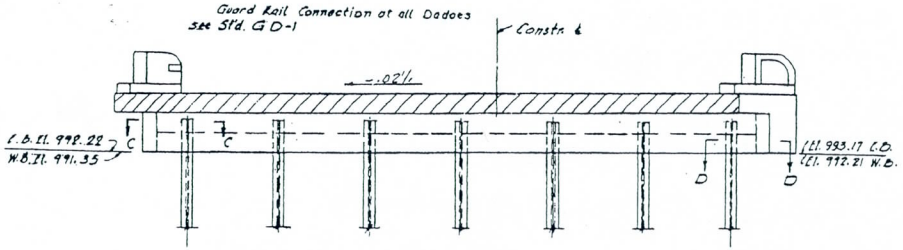


WING WALL ELEVATION
(Typical)



SECTION A-A

DETAIL 'Y'



ELEVATION
E.B. Abut. #1 (Looking Back)
W.B. " #2 (" Ahead)

Note- Elev. shown are on Brg ℄

for Sect B-B, C-C, & D-D see Sh 7 of 9
for Pile Splice Det. see Std. BM-1

		DATE
LAYOUT		
DESIGN	C&W	10-79
DESIGN CK'D		
DRAWN	M.A.	10-79
ORG. CK'D	C.E.N.	1-80
APPROVED	W. Brown	3-80

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
Sta. 670+ E.B. & W.B.
AIRPORT WASH BRIDGE
ABUTMENT DETAILS

SHEET NO. 6 OF 9 | I-10 ROUTE | Maricopa COUNTY | E.B. 10.69 W.B. 10.50 STATION | I-10-7(34) PROJECT NUMBER

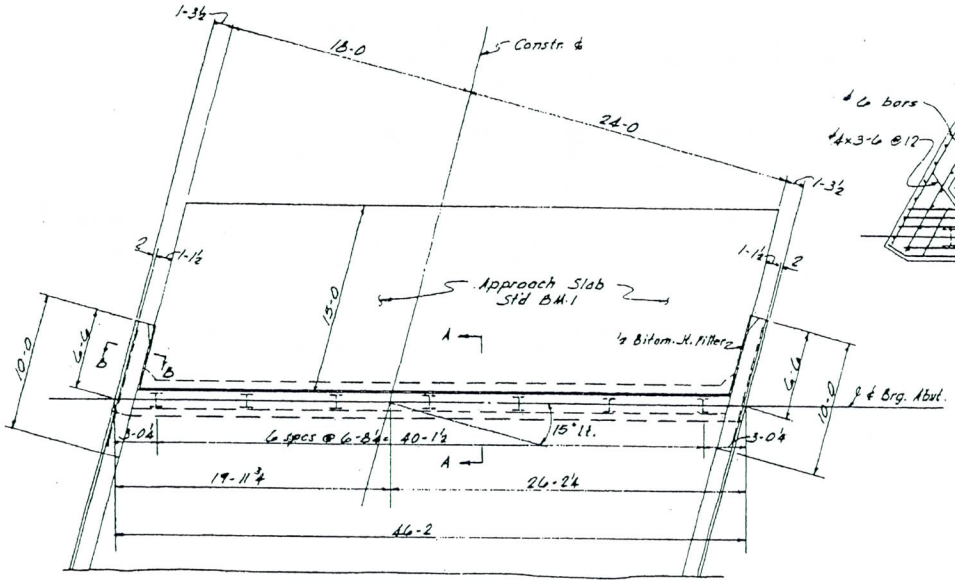
BRIDGE ENGINEER

M-18.7/63

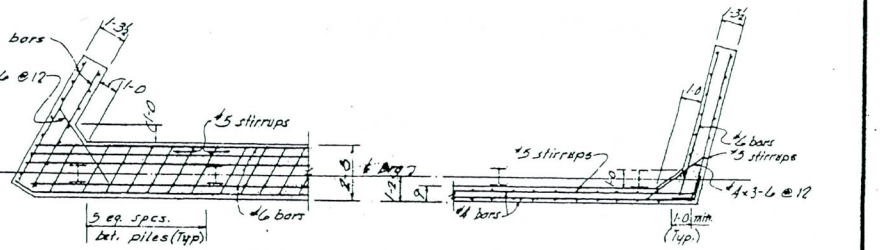
EHRENBERG-PHOENIX HWY.
PERRYVILLE RD.-BULLARD AVE.
MARICOPA COUNTY

REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(34)	158	164	6-15-79

A.A. by E.G.D. 10-85

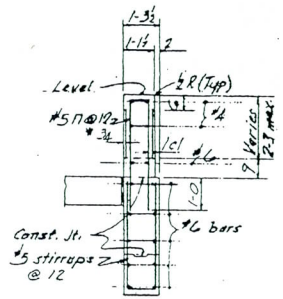


PLAN



SECTION C-C

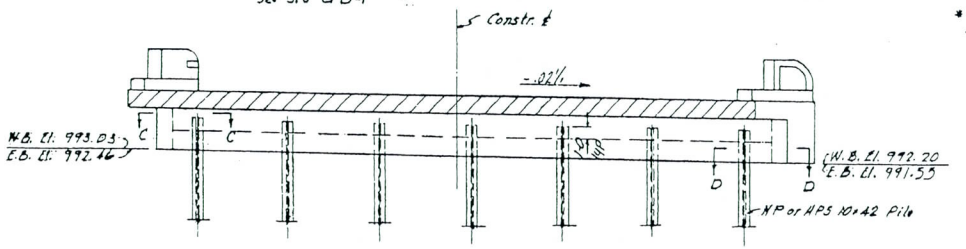
SECTION D-D



* Note - This side flush at Abut #1 E.B.
" " #2 W.B.

SECTION B-B

Guard Rail Connection at all Dadoes see Std GD-1



ELEVATION
W.B. Abut. #1 (Looking Back)
E.B. " #2 (" Ahead)

Note - Elev. shown are on Brg ℄

For Sect. A-A & Wing Wall Elev. see Sh 6 of 9
for Pile Splice Det. see Std BM-1

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	CGW	10-75
DESIGN CK'D		
DRAWN	MG	10-75
QUANTITIES CK'D	CGW	1-76
APPROVED		8-76

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

Sta. 670+ E.B. & W.B.
AIRPORT WASH BRIDGE
ABUTMENT DETAILS

SHEET NO.	OF	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
7	9	I-10	Maricopa	E.B. 1648 W.B. 1650	I-10-2(34)

BRIDGE ENGINEER

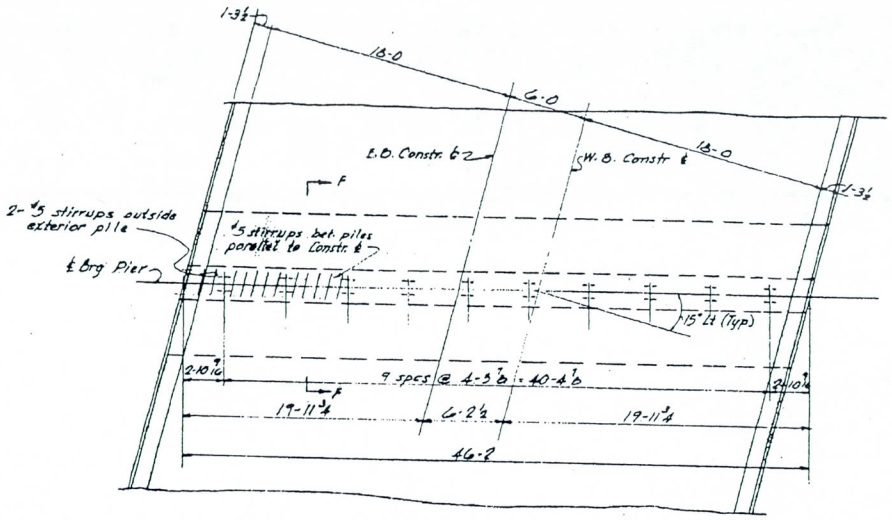
MP 127.15

M-18.7.163

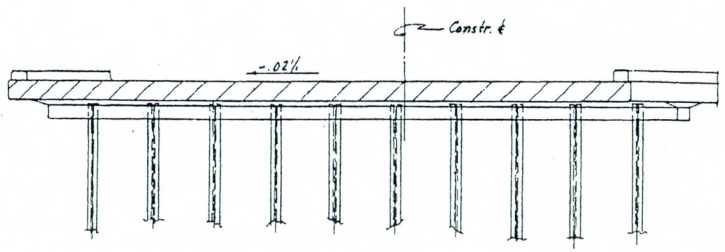
EHRENBERG - PHOENIX HWY
PERRYVILLE RD - BULLARD AVE.
MARICOPA COUNTY

FUNC. SECTION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHTS.	AS BUILT
3	ARIZONA	I-10-2(34)	159	164	6-15-79

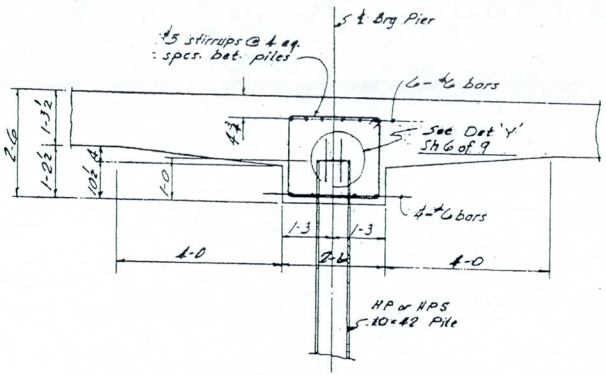
A.A.
..... by E.G.D. 10-85



PLAN
(Looking Ahead)



ELEVATION
W.B. (Looking Ahead)
E.B. (" Back)



SECTION F-F

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	GGW	11-75
DESIGN CK'D		
DRAWN	MB	11-75
DWG CK'D	GGW	1-76
APPROVED	[illegible]	2-76

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

Sta. 6707+ L.B. & W.B.
AIRPORT WASH BRIDGE
PIER DETAILS

SHEET NO. 8 OF 9 | I-10 ROUTE | Maricopa COUNTY | L.B. 1644 W.B. 1645 STRUCTURE NO. | I-10-2(34) PROJECT NUMBER

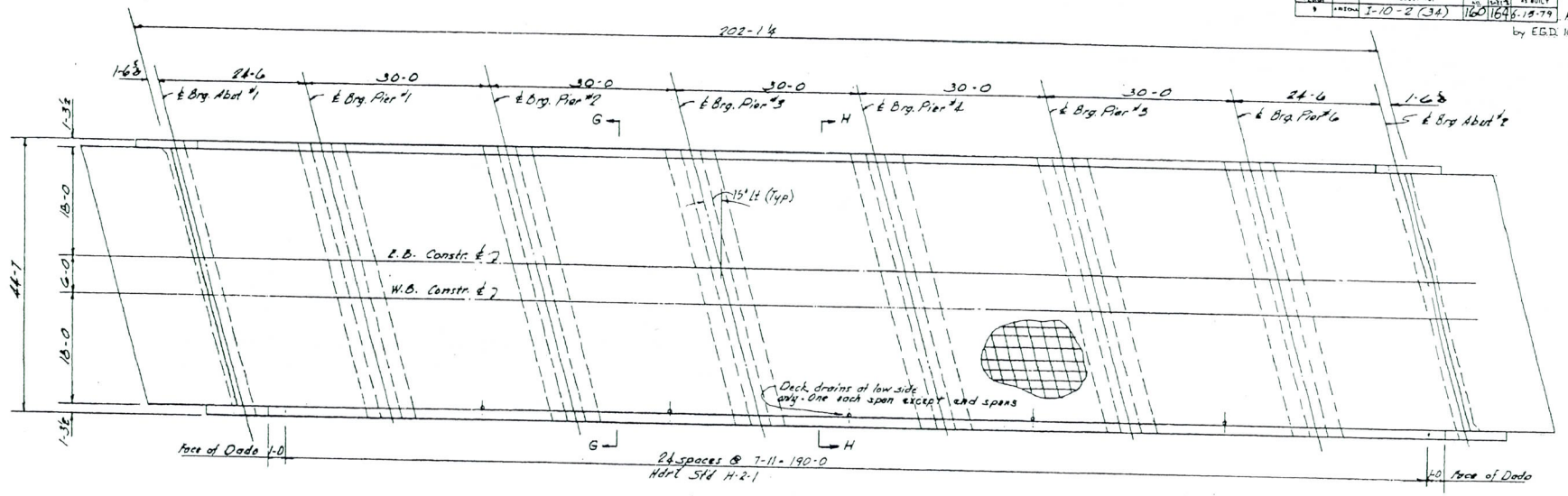
BRIDGE ENGINEER

M-8.2163

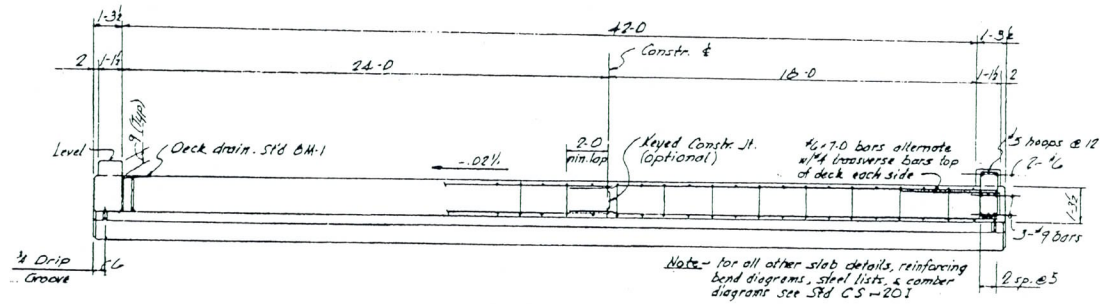
EHRENBERG-PHOENIX HWY
PERRYVILLE RD. - BULLARD AVE.
MARICOPA COUNTY

FUNC. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHTS.	AS BUILT
9	ARIZONA	I-10-2(34)	160	1646-19-79	

A.A. by E.G.D. 10-85



DECK PLAN



Note - for all other slab details, reinforcing bend diagrams, steel lists, & camber diagram see Std CS-201

SECT. G-G (East Bound)
SECT. H-H (West Bound)

For Roadway Drain Det. see Std BM-1

MH8.7.163

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	CGW	10-75
DESIGN CK'D		
DRAWN	MA	10-75
DR CK'D	C.G.W.	1-76
APPROVED	[illegible]	1-76
SHEET NO.	9 OF 9	

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

Sta. 4707 + E.B. & W.B.
AIRPORT WASH BRIDGE
DECK DETAILS

I-10	Maricopa	EB 1529 WB 1530	I-10-2(34)
ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER

MP 127.15

BRIDGE ENGINEER

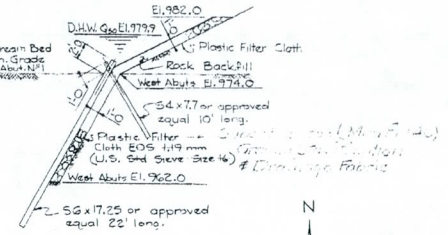
EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

NOTES:

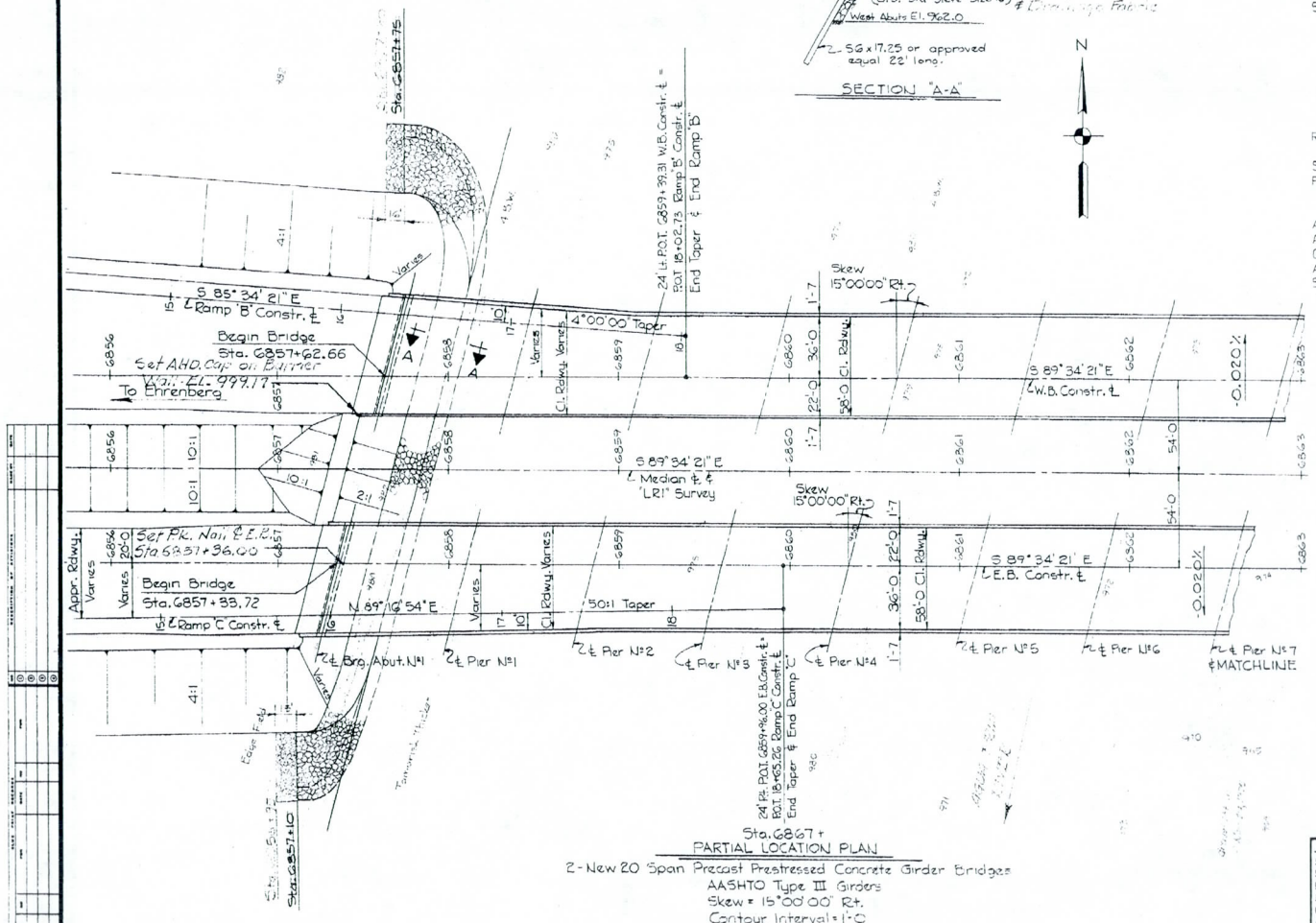
Rocks shall be sound and durable, of rounded or angular shape and with a nominal diameter of 3" min. and 6" max. Flat or needle shapes are not acceptable. (Rock is available at job site.)

3" x 3" W19/W19 Galvanized wire mesh shall be used.

Unless specified otherwise, all other details shall be the same as Sta. C-17.01 (Type 2).



SECTION "A-A"



2-New 20 Span Precast Prestressed Concrete Girder Bridges
AASHTO Type III Girders
Skew = 15°00'00" Rt.
Contour Interval = 1'-0

GENERAL NOTES:

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	6	47	4-11-79

Construction - Std Specs Ariz. Hwy. Dept Edition of 1969, revised to date.
Design - AASHTO Specs for Hwy. Bridges 1973, revised to date.
Dead load - Dead load includes allowance of 25 pounds per square foot for future wearing surface.
Loading Class - HS20-44 and/or Interstate Alternate Loading.
Composite Design - Dead load by girders only.
All concrete shall be Class S.

Stresses: Deck Slab — f'_c = 1,400 psi
Superstructure — f'_c = 4,500 psi
AASHTO Type III Girders — f'_c = 5,000 psi
Columns and cap beams — f'_c = 3,500 psi
Traffic Barrier and all other concrete — f'_c = 3,000 psi
Structural Steel — f_s = 20,000 psi
Gr. 40 Reinf. Steel — f_s = 20,000 psi
Gr. 60 Reinf. Steel — f_s = 24,000 psi
Prestressing Steel - ½" ϕ 7 wire strand — f_s = 270,000 psi

Reinforcing steel shall conform to ASTM Spec. A615. Bar size #7 and smaller shall be grade 40. Bar size #8 and larger shall be grade 60.
Structural steel shall conform to ASTM Spec. A36.
Paint and painting shall conform to Std. Specs. Contact surfaces shall not be painted. Structural Steel - Shop - 1 coat paint #1A or #1B, #3 and #10. No field paint required.
All dimensions for reinforcing steel shall be to center of bars unless noted otherwise.
All reinforcing steel shall have 2" clear cover unless noted otherwise.
Chamfer all exposed corners ¾" as per Std. BM-1 unless noted otherwise.
All welding shall conform to the requirements of the American Welding Society "Structural Welding Code D1.1-75 revised to date.

SHEET LIST

Title	Sheet Number
Location Plan	1,2,3
Location Details	4,5,6
Approximate Quantities	7
Foundation Data Sheet	8,9,10,11,12,13,14
Footing Plan EB & WB	15,16,17
Abutment N°1 Details EB	18
Abutment N°1 Details WB	19
Abutment N°2 EB & WB	20
Abutment Details EB & WB	21
Pier N°1 Details EB	22
Pier N°2 Details EB	23
Pier N°1 Details WB	24
Pier N°2 Details WB	25
Integal Pier Details EB & WB	26
Expansion Pier Details EB & WB	27
Pier Details EB & WB	28
Pier Elevations EB & WB	29
Girder Details EB	30
Girder Details WB	31
Girder Details EB & WB	32
Post Tensioned Girder Alt. EB & WB	33
Deck Plan EB	34,35,36
Deck Plan WB	37,38,39
Deck Details EB & WB	40
Screed & Finish Grade Elevations	41
Alternate Deck Details EB & WB	42

AS BUILT
COMPLETION DATE 4-11-79

		DATE
LAYOUT	J. Milne	12-76
DESIGN	J.J. Feeney	5-76
DESIGN CK'D	W.S.F.	3-77
DRAWN	C. Stanley	1-1-76
CK'D	J.J.F.	6-77
APPROVED	J. Miller	6-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
Sta. 6867+
AGUA FRIA RIVER BRIDGES
LOCATION PLAN

SHEET NO. 1 OF 42 | I-10 ROUTE | Maricopa COUNTY | F.B. 1552 W.B. 1853 STRUCTURE NO. | I-10-2(44) PROJECT NUMBER

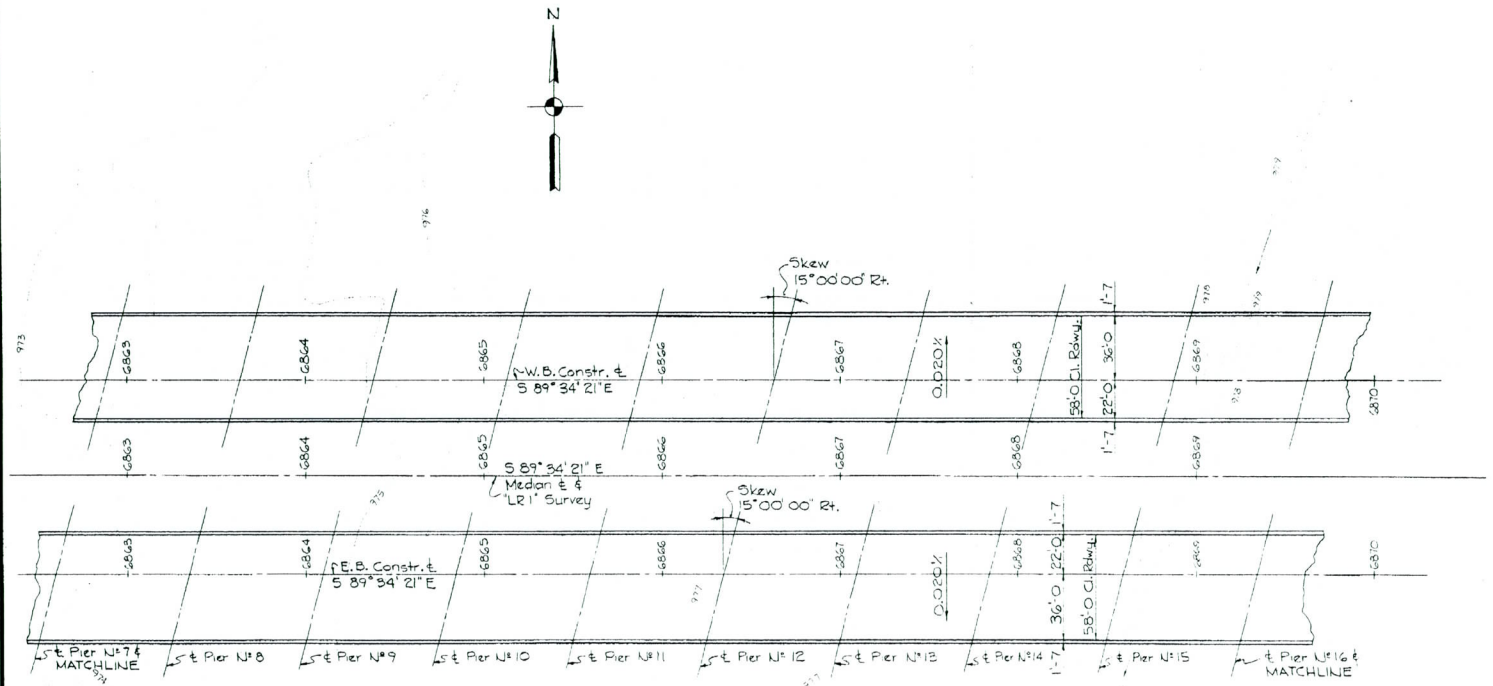
BRIDGE ENGINEER

Topo Map 7564 M-1

MP 130.00 I-10-2(35) P.E.

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FORM NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	7	47	4-11-79



Sta. 6867+

PARTIAL LOCATION PLAN

2 - New 20 Span Precast Prestressed Concrete Girder Bridges
AASHTO Type III Girders
Skew = 15°00'00" Rt.
Contour Interval = 1'-0

		DATE
LAYOUT	J. Milne	12-75
DESIGN	J.W.F.	3-76
DESIGN CHK'D	W.S.K.	3-77
DRAWN	K. Smith	1-14-76
CHECKED	J.W.F.	4-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

Sta. 6867+
AGUA FRIA RIVER BRIDGES
LOCATION PLAN

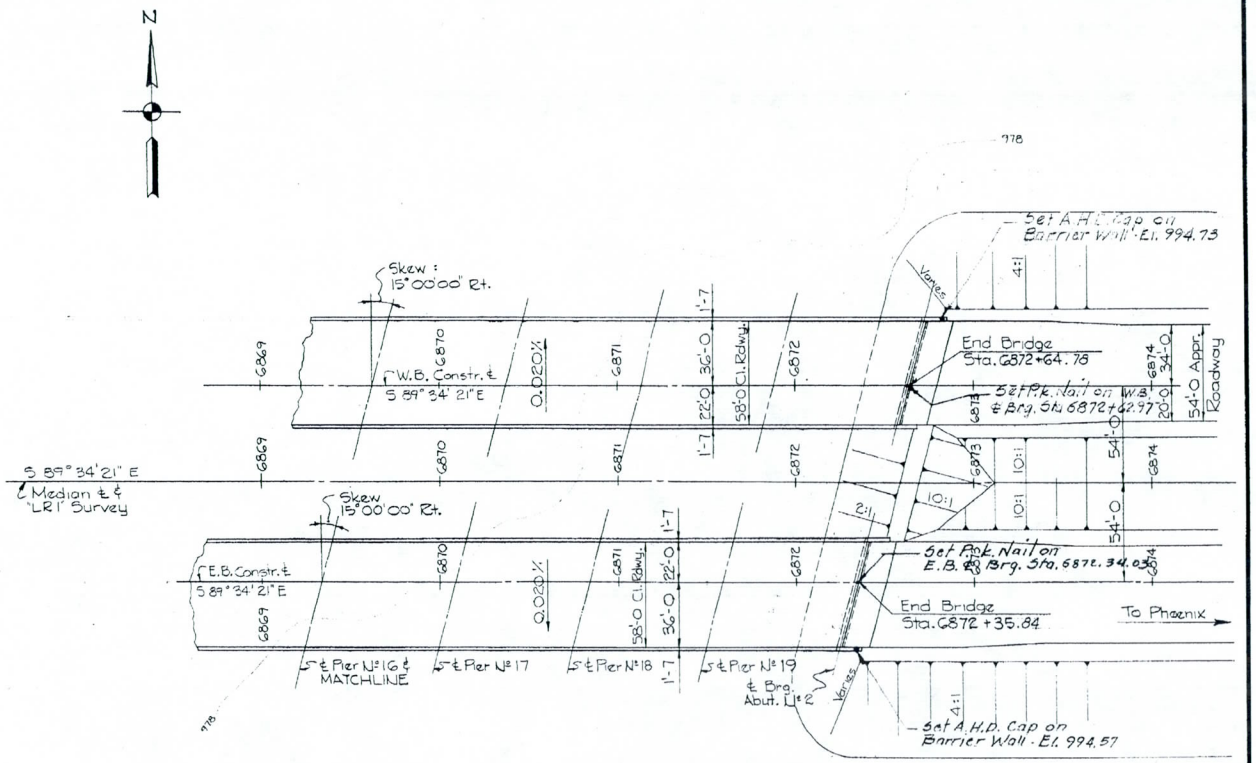
SHEET NO. 2 OF 42 | I-10 ROUTE | Maricopa COUNTY | F.A.P. 1825 W.P. 1825 STRUCTURE NO. | I-10-2(44) PROJECT NUMBER

BRIDGE ENGINEER

I-10 120-00 I-10-2(55) P.E.

EHRENBERG-PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	8	47	4-11-79



Sta. 6867+
PARTIAL LOCATION PLAN

2- New 20 Span Precast Prestressed Concrete Girder Bridges
AASHTO Type III Girders
Skew: 15°00'00" Rt.
Contour Interval = 1'-0

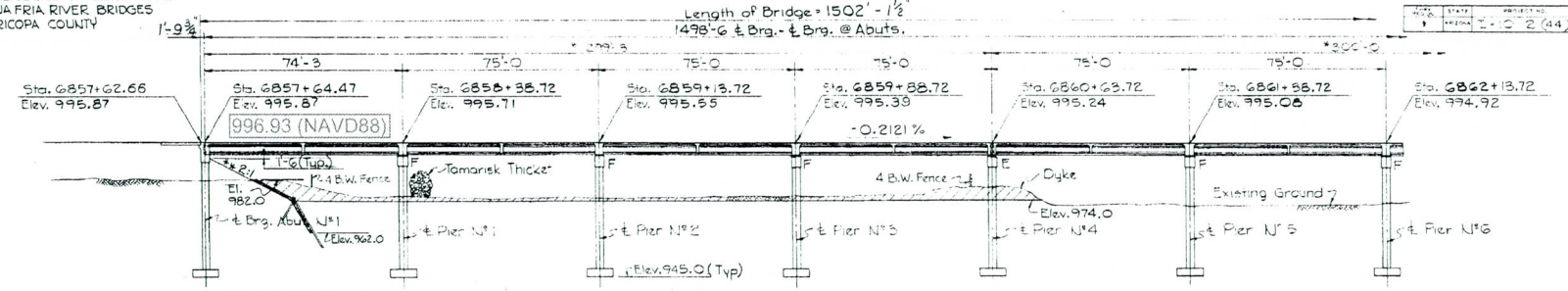
		DATE
LAYOUT	J. Milne	12-75
DESIGN	J.J.F.	3-76
DESIGN CKD	W.S.E.	3-77
DRAWN	[illegible]	4-77
CHECKED	J.J.F.	4-77
APPROVED	J. Milne	8-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
Sta. 6867+
AGUA FRIA RIVER BRIDGES
LOCATION PLAN

SHEET NO.	OF	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
3	42	I-10	Maricopa	E.B. 1856 W.B. 1553	I-10-2(44)

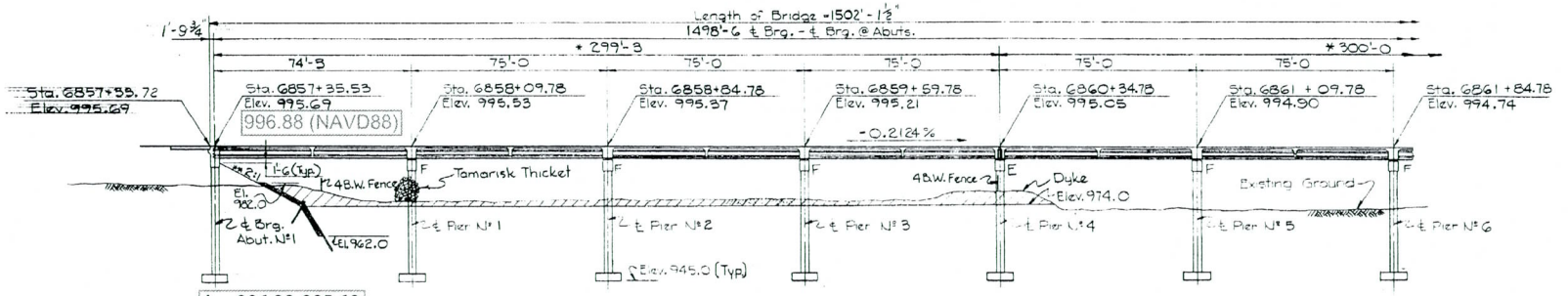
BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY



Δ = 996.93-995.87
= 1.07 ft

SECTION ALONG W.B. CONSTR. ℄



Δ = 996.88-995.69
= 1.19 ft

SECTION ALONG E.B. CONSTR. ℄

NOTE:
See Std. C-13.12 for Structural Excavation limits.

(Without Future Flood Control)
Q_{100} = 57,000 cfs
H.W. = 981.8

(With Future Flood Control)
Q_{50} = 30,500 cfs Q_{100} = 43,000 cfs
H.W. Elev. = 979.4 H.W. Elev. = 980.5
D.A. 1520 sq. mi. (Total)

Conversion Equation for As-Built Elevations:
I-10 Project Elevations (NAVD88) = As-Built Elevations + 1.20 ft

(Note: It appears that the I-10 Bridge As-Built Elevations are on the same datum used for the Agua Fria River Channel Improvements project, FCDMC, 1985)

NOTE:
Hatched areas indicate Channel Cleanout - Future Contract

* Length of Bridge Continuous for Live Load.
** Normal to ℄ Brg.

		DATE
LAYOUT	J. Milne	10-75
DESIGN	J.V.F	3-76
DESIGN CHK.	W.S.K.	3-77
DRAWN	K.Brandt	1-78
CHECKED	J.V.F	4-77
APPROVED	J. Miller	4-77

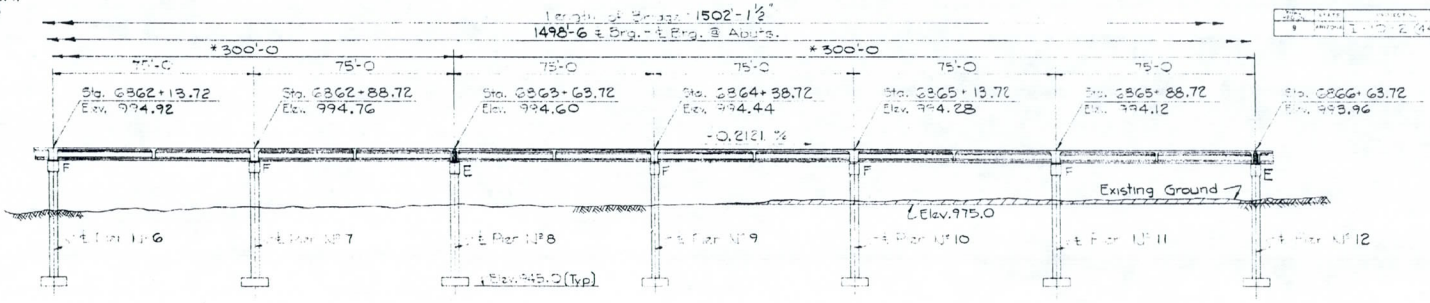
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
Sta. 6867+
AGUA FRIA RIVER BRIDGES
LOCATION DETAILS

SHEET NO. 4 OF 42 | 1-10 | Maricopa | E.B. 1852 W.B. 1858 | I-10-3(44)

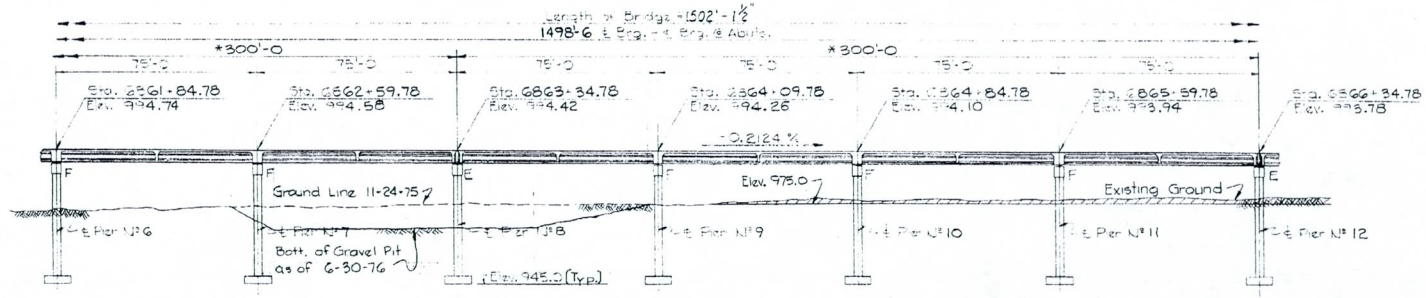
BRIDGE ENGINEER

I-10-3(℄) F.E.

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY



SECTION ALONG W.B. CONTR. ℄



SECTION ALONG E.B. CONTR. ℄

(Without Future Flood Control)
Q_{100} = 57,000 cfs
H.W. = 981.8

(With Future Flood Control)
Q_{100} = 30,500 cfs Q_{500} = 43,000 cfs
H.W. Elev. = 973.4 H.W. Elev. = 980.5
D.A. = 1520 sq. mi. (Total)

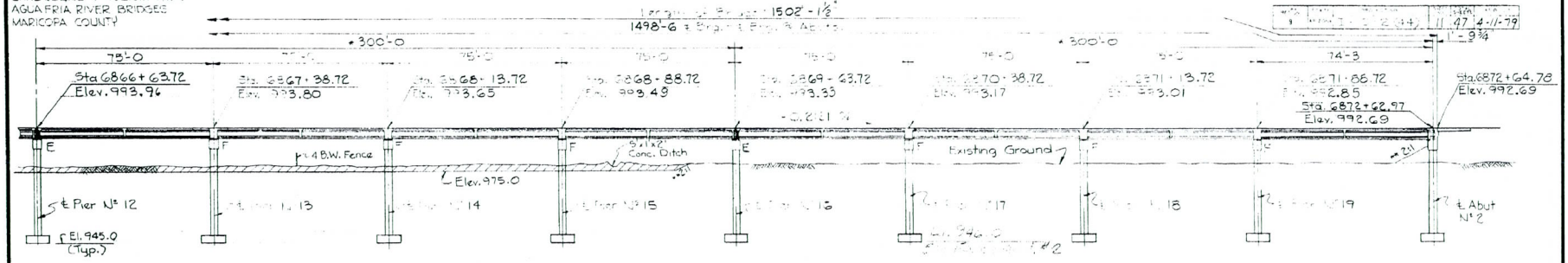
NOTE: Ignore Gila River Channel Control.
Future Contract

*Length of Bridge Continuous for Live Load.

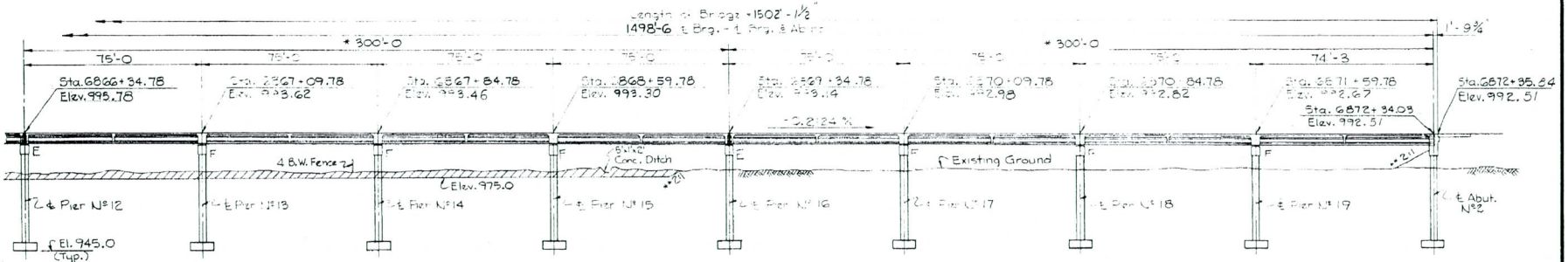
DRAWN	J. Milne		ARIZONA DEPARTMENT OF TRANSPORTATION		
DESIGN	J. J. F.	3-76	HIGHWAYS DIVISION		
QUANTITIES	W. S. K.	3-77	STRUCTURES SECTION		
CHECKED	W. S. K.	3-76	Sta. 28+27 =		
APPROVED	J. J. F.	4-77	AGUA FRIA RIVER BRIDGES		
SUPERVISED	J. Miller	4-77	LOCATION DETAILS		
SHEET NO. 5	OF SHEETS 42	ROUTE 10	Maricopa COUNTY	F.A.P. 1853 W.B. 1853	PROJECT NUMBER I-10-2(44)

I-10 130.00 I-[illegible](55) P.E.

EHRENBERG - PHOENIX H.W.Y.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY



SECTION ALONG N.B. ROADWAY ℄



SECTION ALONG S.B. ROADWAY ℄

(Without Future Flood Control)
Q_{100} = 57,000 cfs
H.W. = 981.8

(With Future Flood Control)
Q_{100} = 30,500 cfs
H.W. Elev. = 979.4
Q_{500} = 43,000 cfs
H.W. Elev. = 980.5
[illegible] = 1520 sq. ft. (Sta. [illegible])

NOTE: [illegible] Future Contract

* Length of Bridge Continuous for Live Load.
** Normal to ℄ Brg.

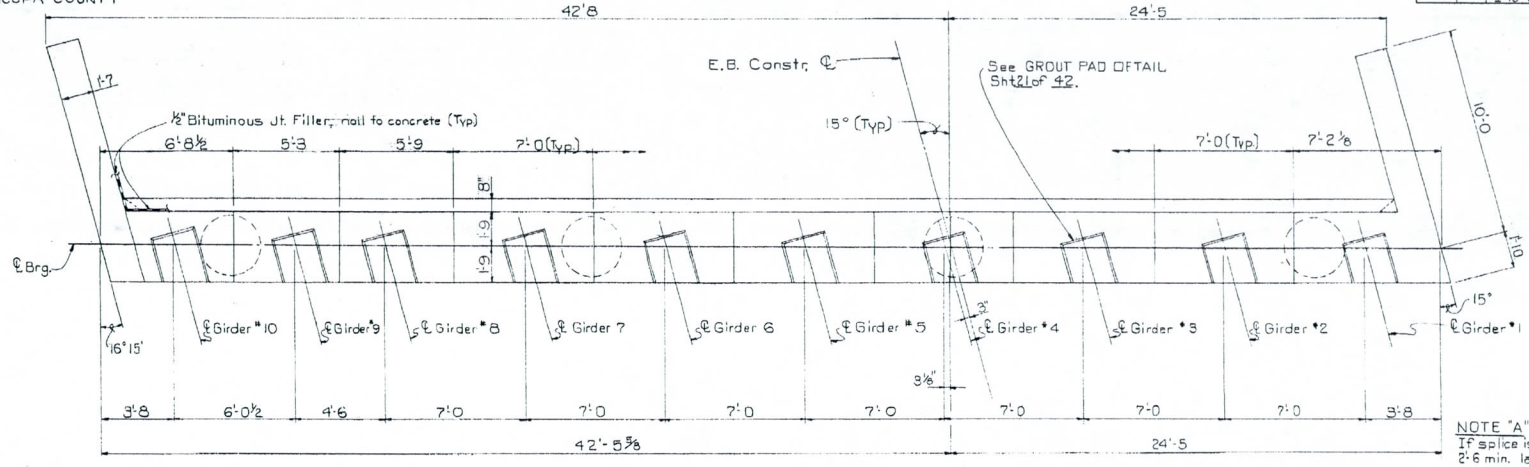
DESIGNED	V.J.F.	3-76
DETAILED	W.S.K.	3-77
DRAWN	K.S.N.	3-77
CHECKED	V.J.F.	4-77
APPROVED	J. Miller	4-77
SHEET NO.	6 of 42	

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
Sta. 6867+
AGUA FRIA RIVER BRIDGES
LOCATION DETAILS
E.A. 1882
W.O. 1858
PROJECT NO. [illegible]
JOB NO. [illegible] of 44

I-10 13000 I-10-1(55) P.E.

EHRENBERG - PHOENIX HWY
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

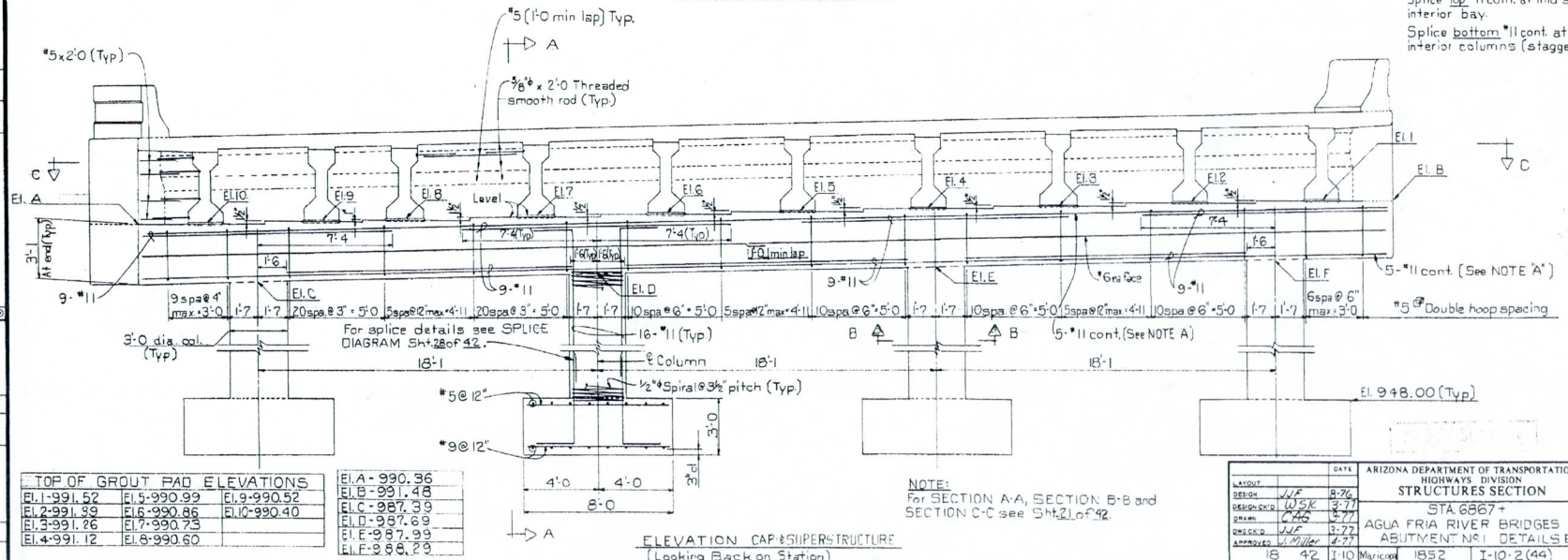
FED. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	23	47	4-11-79



PLAN - ABUTMENT CAP

NOTE "A"
If splice is required for #11 cont. use 2'-6 min. lap

Splice top #11 cont. at mid-span of interior bay.
Splice bottom #11 cont. at ℄ of interior columns (stagger)



ELEVATION CAP & SUPERSTRUCTURE
(Looking Back on Station)

TOP OF GROUT PAD ELEVATIONS		
El. 1-991.52	El. 5-990.99	El. 9-990.52
El. 2-991.39	El. 6-990.86	El. 10-990.40
El. 3-991.26	El. 7-990.73	
El. 4-991.12	El. 8-990.60	

El. A - 990.36	
El. B - 991.48	
El. C - 987.39	
El. D - 987.69	
El. E - 987.99	
El. F - 988.29	

NOTE:
For SECTION A-A, SECTION B-B and SECTION C-C see Sht 21 of 42.

		DATE
LAYOUT		
DESIGN	JNF	8-76
DESIGN CK'D	WSK	3-77
DRAWN	CHS	3-77
CHECKED	JNF	3-77
APPROVED	W. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867+
AGUA FRIA RIVER BRIDGES
ABUTMENT No. 1 DETAILS EB.

SHEET NO.	OF	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
18	42	I-10	Maricopa	1852	I-10-2(44)

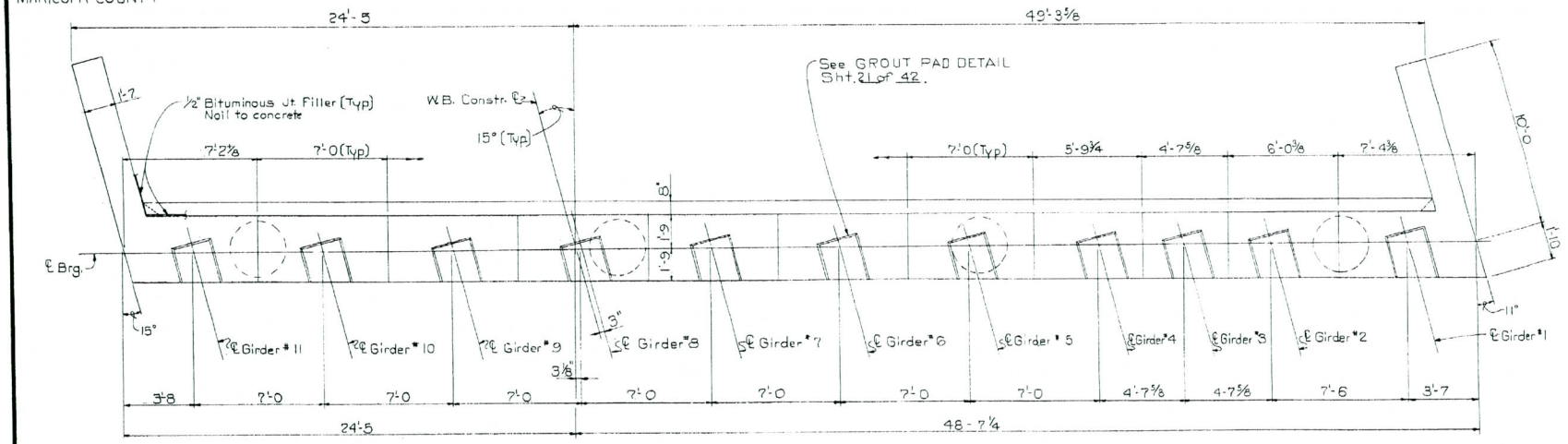
BRIDGE ENGINEER

141

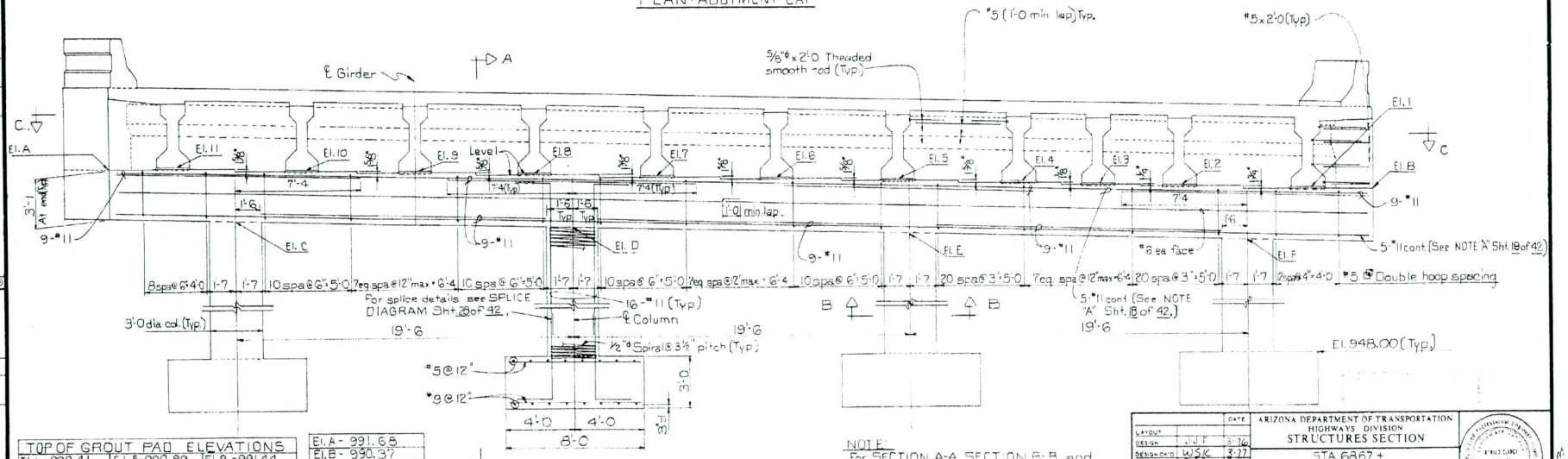
I-10 130.0(1)

EHRENBERG - PHOENIX HWY
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FED. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	24	42	4-11-79



PLAN-ABUTMENT CAP



TOP OF GROUT PAD ELEVATIONS		
El. 1 - 990.41	El. 5 - 990.89	El. 9 - 991.44
El. 2 - 990.56	El. 6 - 991.03	El. 10 - 991.58
El. 3 - 990.66	El. 7 - 991.16	El. 11 - 991.72
El. 4 - 990.75	El. 8 - 991.30	

El. A - 991.68	
El. B - 990.37	
El. C - 988.47	
El. D - 988.12	
El. E - 987.77	
El. F - 987.42	

ELEVATION CAP & SUPERSTRUCTURE
(Looking Back on Station)

NOTE:
For SECTION A-A, SECTION B-B and SECTION CC see Sht. 21 of 42.

		DATE
LAYOUT		
DESIGN	J.J.F.	3-76
DESIGN CHKD	W.S.K.	3-77
DRAWN	C.M.S.	3-77
DRAWN CHKD	J.J.F.	4-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA 6867 +
AGUA FRIA RIVER BRIDGES
ABUTMENT No. 1 DETAILS WB.

SHEET NO.	OF	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
19	42	I-10	Maricopa	1855	I-10-2(44)

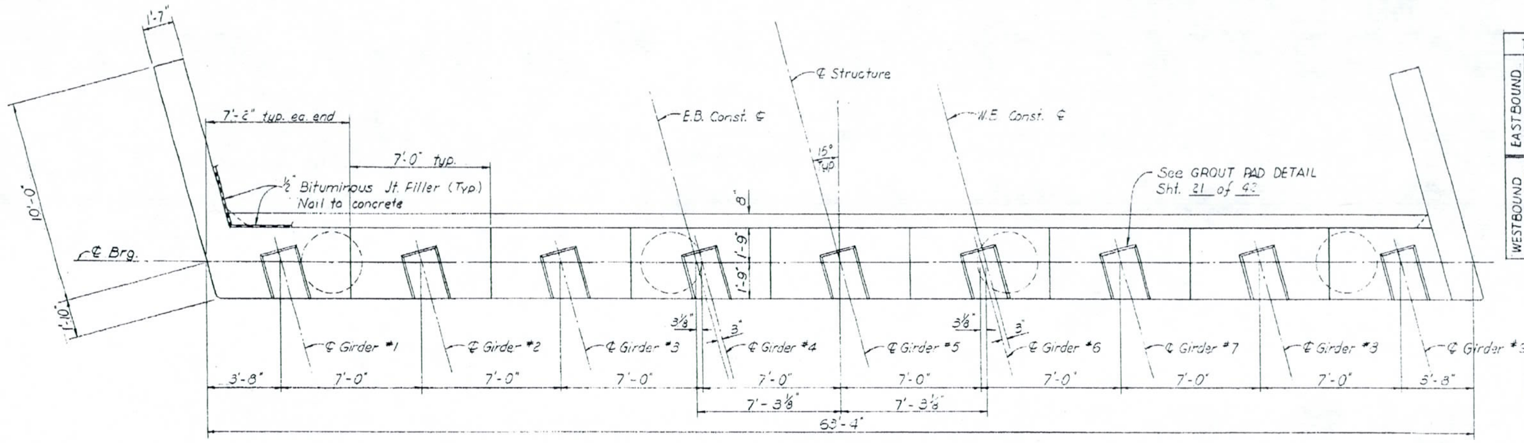
BRIDGE ENGINEER

I-10 130.00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

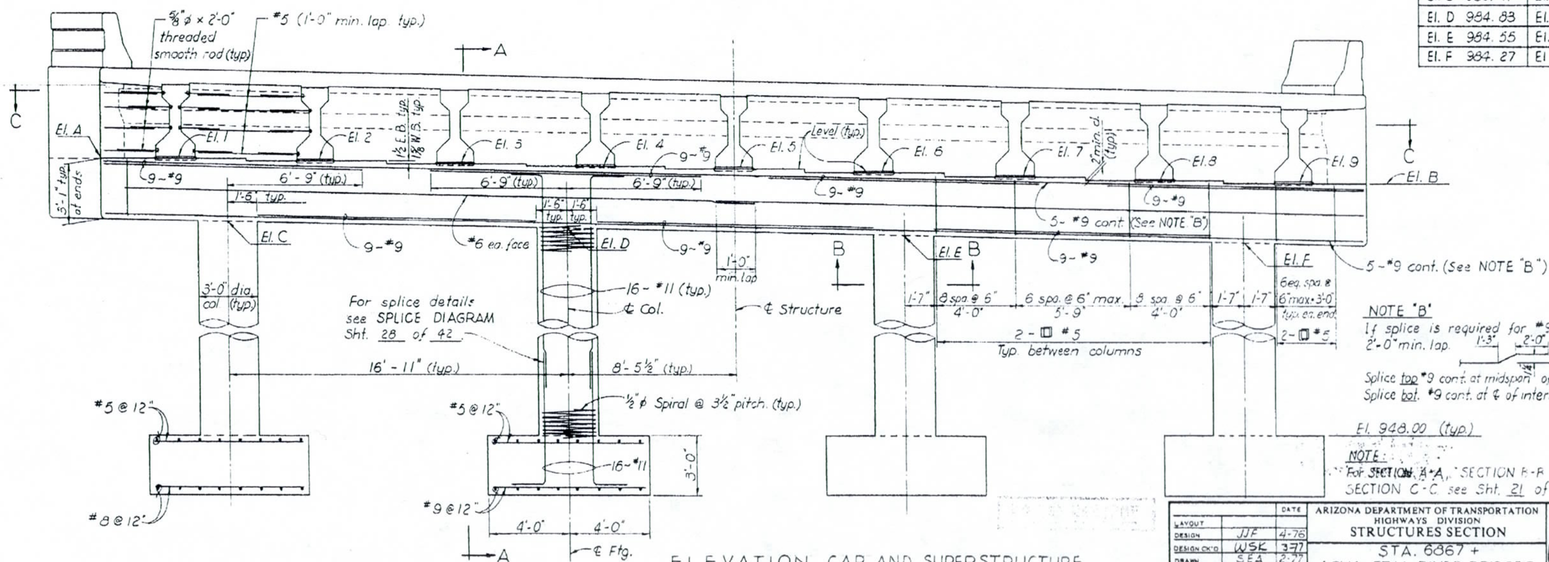
REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2 (44)	25	47	4-11-77

TOP OF GROUT PAD ELEVATIONS				
EASTBOUND	El. 1	988. 33	El. 6	987. 68
	El. 2	988. 20	El. 7	987. 55
	El. 3	988. 07	El. 8	987. 42
	El. 4	987. 94	El. 9	987. 29
	El. 5	987. 81		
WESTBOUND	El. 1	987. 43	El. 6	988. 13
	El. 2	987. 57	El. 7	988. 26
	El. 3	987. 71	El. 8	988. 40
	El. 4	987. 85	El. 9	988. 54
	El. 5	987. 99		



PLAN - ABUT. CAP

ELEVATIONS			
EASTBOUND		WESTBOUND	
El. A	988. 29	El. A	987. 39
El. B	987. 25	El. B	988. 50
El. C	985. 11	El. C	984. 42
El. D	984. 83	El. D	984. 72
El. E	984. 55	El. E	985. 02
El. F	984. 27	El. F	985. 32



ELEVATION CAP AND SUPERSTRUCTURE
E.B. shown, W.B. similar except for slope.
Looking Ahead on Station

NOTE "B"
If splice is required for #9 cont. use 2'-0" min. lap.
Splice top #9 cont. at midspan of interior bay.
Splice bot. #9 cont. at ℄ of interior cols. (staggered)

El. 948.00 (typ.)

NOTE:
For SECTION A-A, SECTION B-B and SECTION C-C see Sht. 21 of 42.

		DATE
LAYOUT		
DESIGN	JJF	4-76
DESIGN CH'D	WSK	3-77
DRAWN	SEA	2-77
DWG CH'D	JJF	2-77
APPROVED	J. Miller	4-77

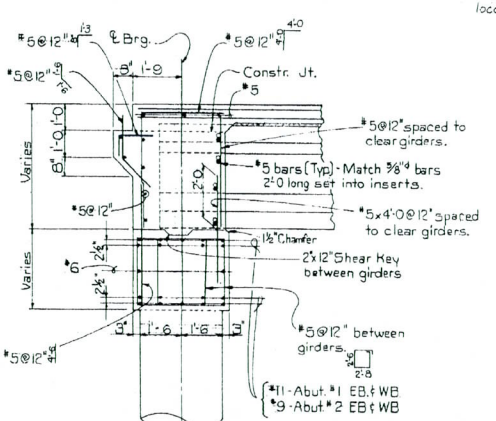
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867 +
AGUA FRIA RIVER BRIDGES
ABUTMENT NO. 2 E.B & W.B.

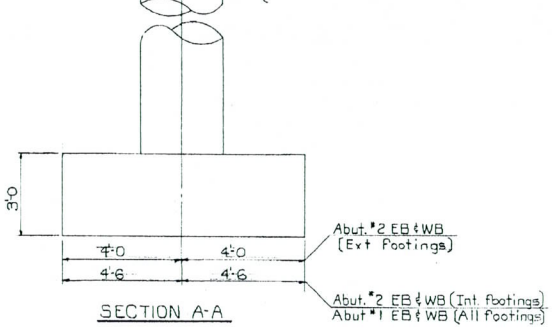
SHEET NO. 20 of 42 | I-10 ROUTE | Maricopa COUNTY | E.B.-1852 W.B.-1853 STRUCTURE NO. | I-10-2 (44) PROJECT NUMBER

BRIDGE ENGINEER

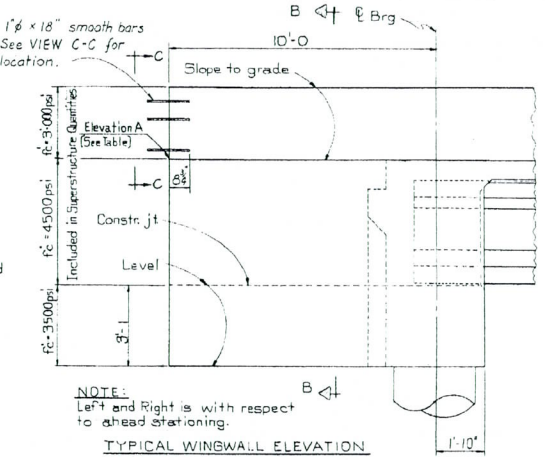
EHRENBERG - PHOENIX HWY
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

PROJ. DESIGN	STATE	PROJECT NO.	SHEET NO.	TOTAL SHTS.	AS BUILT
B	ARIZONA	I-10-2(44)	26	47	4-11-77





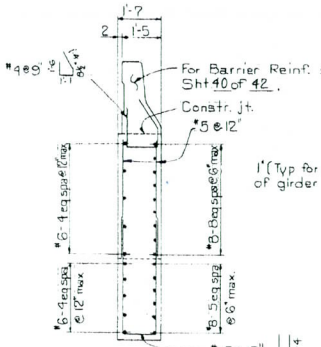
SECTION A-A



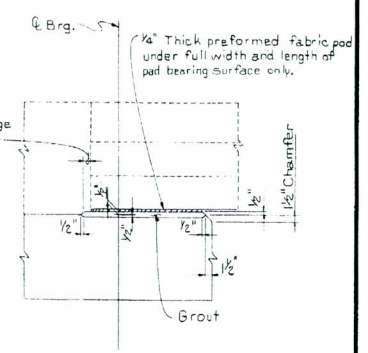
NOTE:
Left and Right is with respect to ahead stationing.

TYPICAL WINGWALL ELEVATION

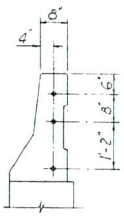
ELEVATION A		
Abutment	Left	Right
#1 E.B.	996.17	994.92
#2 E.B.	992.94	991.76
#1 W.B.	994.93	996.38
#2 W.B.	991.90	993.16



SECTION B-B



GROUT PAD DETAIL



VIEW C-C

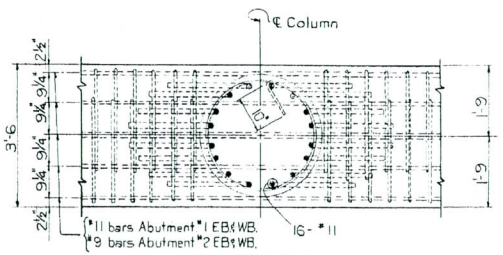
SPIRAL NOTES:

Spirals shall be cold drawn steel wire conforming to current AASHTO Spec. M92.

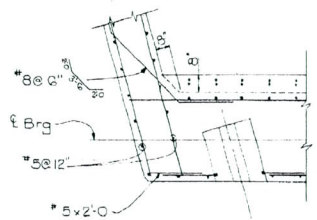
Spiral splices shall be anchored with a 135° hook around one of the vertical bars and shall lap a minimum distance of one half turn.

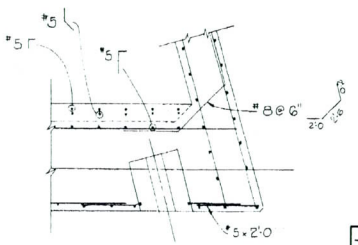
The ends of the spirals shall be anchored with a 135° hook around one of the vertical bars.

Spiral reinforcement shall extend from the top of footing reinforcement to the bottom of cap reinforcement.



SECTION B-B





SECTION C-C

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	J.J.F.	5-76
DESIGN CK'D	W.S.K.	3-77
DRAWN	C.R.B.	3-77
DISC'D	J.J.F.	6-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 6867+
AGUA FRIA RIVER BRIDGES
ABUTMENT DETAILS EB&WB

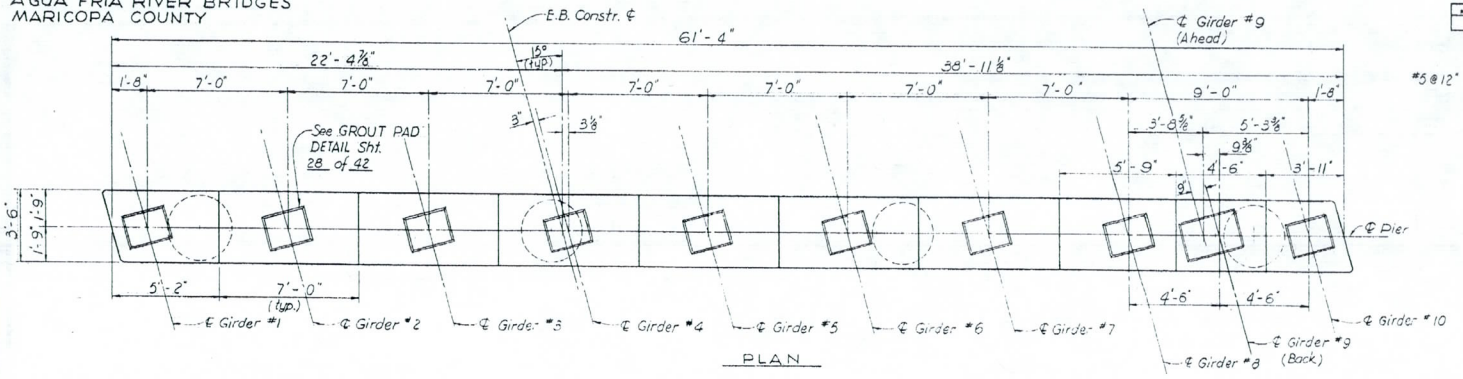
SHEET NO.	OF	ROUTE	COUNTY	EB - I552 WB - I553 FEDERAL AID NO.	PROJECT NUMBER
21	42	I-10	Maricopa		I-10-2(44)

REGISTERED ENGINEER
MOSLEY
ARIZONA, U.S.A.
DATE 11-77
BRIDGE ENGINEER

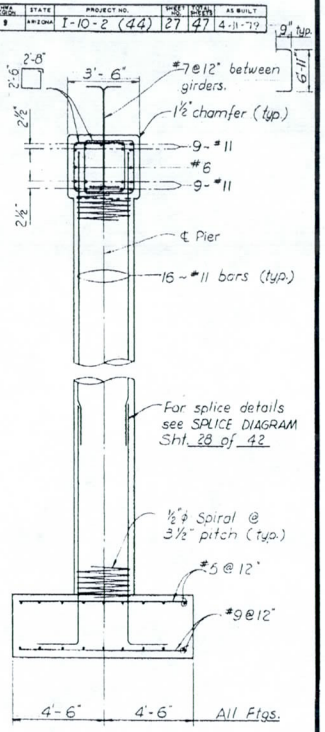
I-10 120 (22)

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

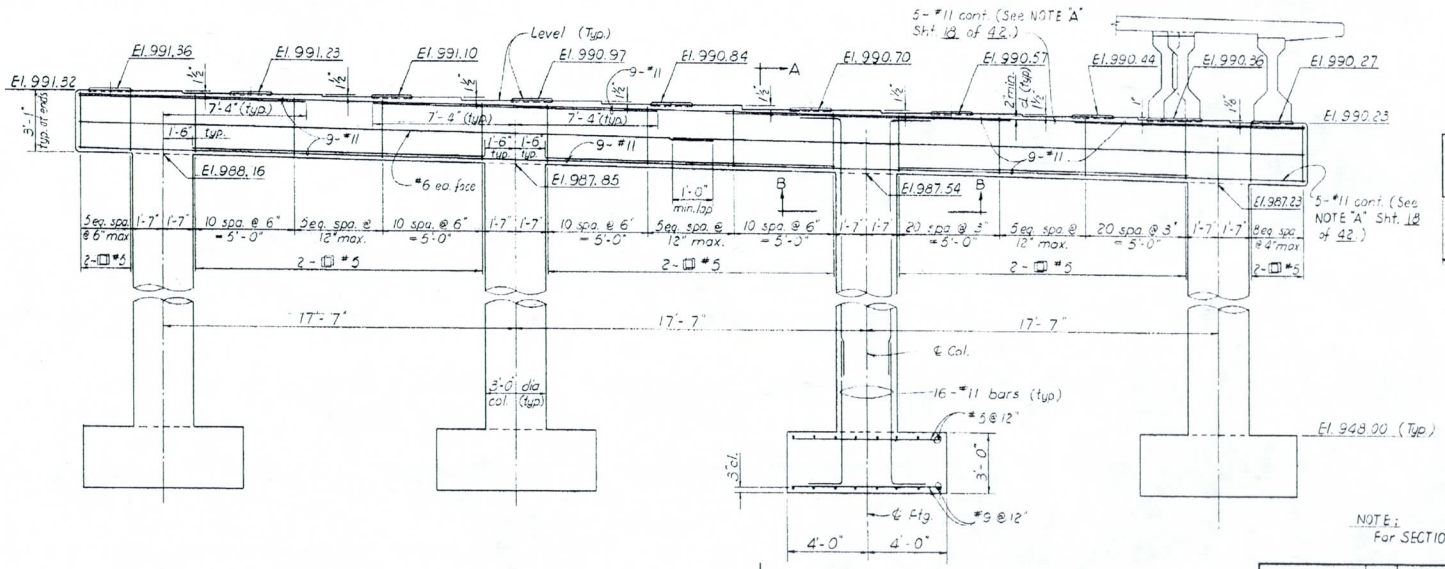
FUNC. HIGHWAY	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2 (44)	27	47	4-11-79



PLAN



SECTION A-A



ELEVATION AT ℄ PIER
(Looking Ahead on Station)

NOT FOR CONSTRUCTION

NOTE:
For SECTION B-B see Sht. 29 of 42.

		DATE
LAYOUT		
DESIGN	JJF	8-76
DESIGN CK'D	WSK	3-77
DRAWN	SEA	2-77
REVISED	JJF	2-77
APPROVED	J. Miller	9-77
SHEET NO. 22 OF 42		1-10

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 8867+
AGUA FRIA RIVER BRIDGES
PIER No.1 DETAILS E.B.

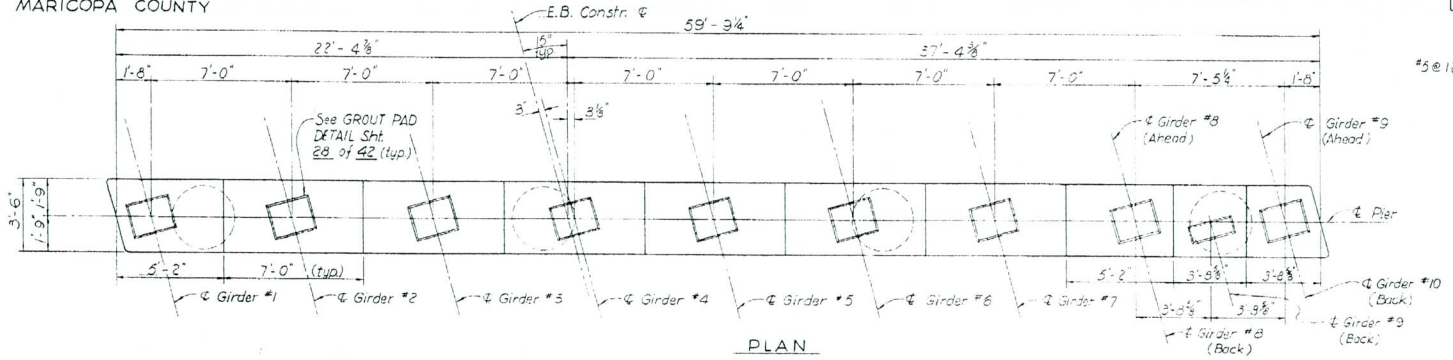
ROUTE	COUNTY	E.B. 1832 W.B. 1833 STRUCTURE NO.	PROJECT NUMBER
I-10	Maricopa		I-10-2 (44)

BRIDGE ENGINEER

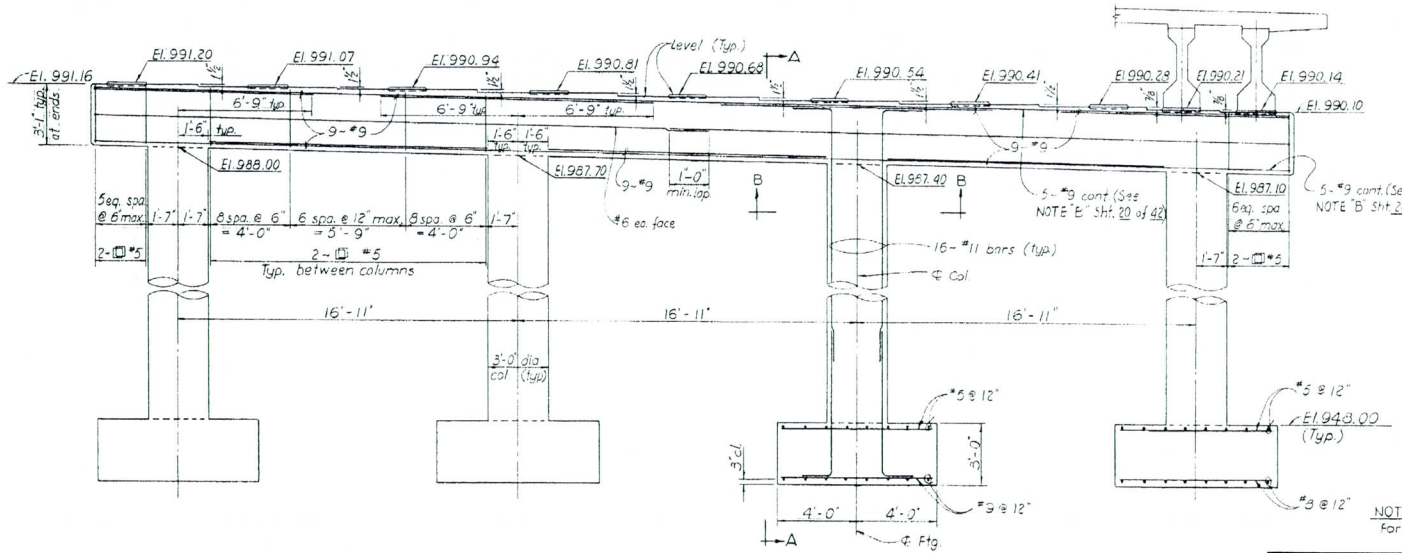
I-10 130.00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

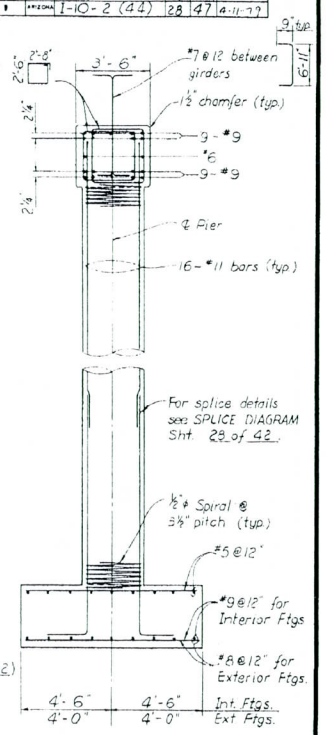
FED. ROAD DESIGN	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2 (44)	28	47	4-11-77



PLAN



ELEVATION AT ℄ PIER
(Looking Ahead on Station)



SECTION A-A

DO NOT DESTROY

NOTE:
For SECTION B-B see Sht. 28 of 42

		DATE
LAYOUT		
DESIGN	JJF	8-75
DESIGN CK'D	WSK	3-77
DRAWN	SEA	2-77
CHECK'D	JJF	2-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 6867+
AGUA FRIA RIVER BRIDGES
PIER No. 2 DETAILS E.B.

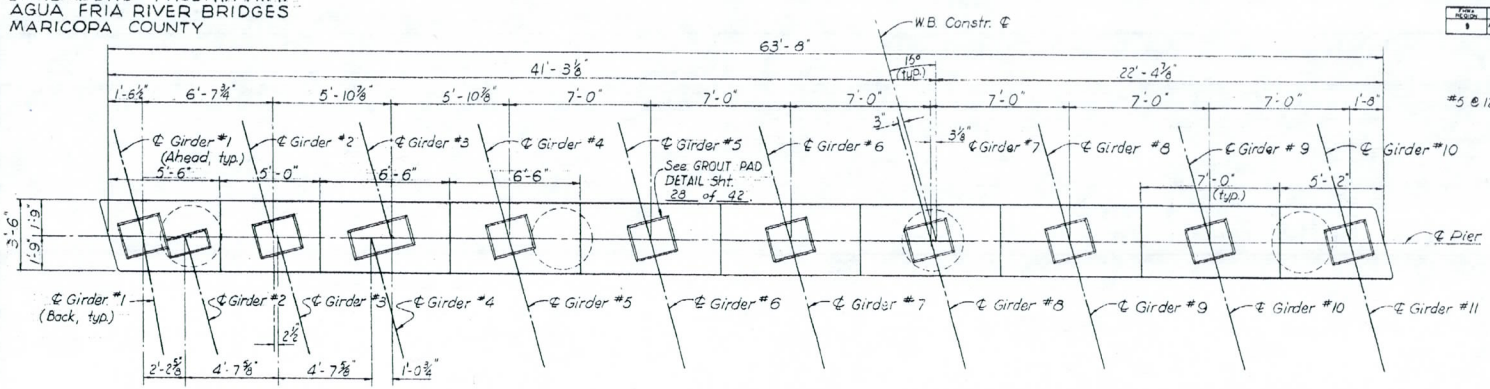
SHEET NO.	ROUTE (CONST.)	E.B. 1852 W.B. 1853 STRUCTURE NO.	PROJECT NUMBER
28 of 42	I-10 Maricopa		I-10-2 (44)

STATE OF ARIZONA — DEPT. OF TRANSPORTATION — DEC. 31, 19 — BRIDGE ENGINEER

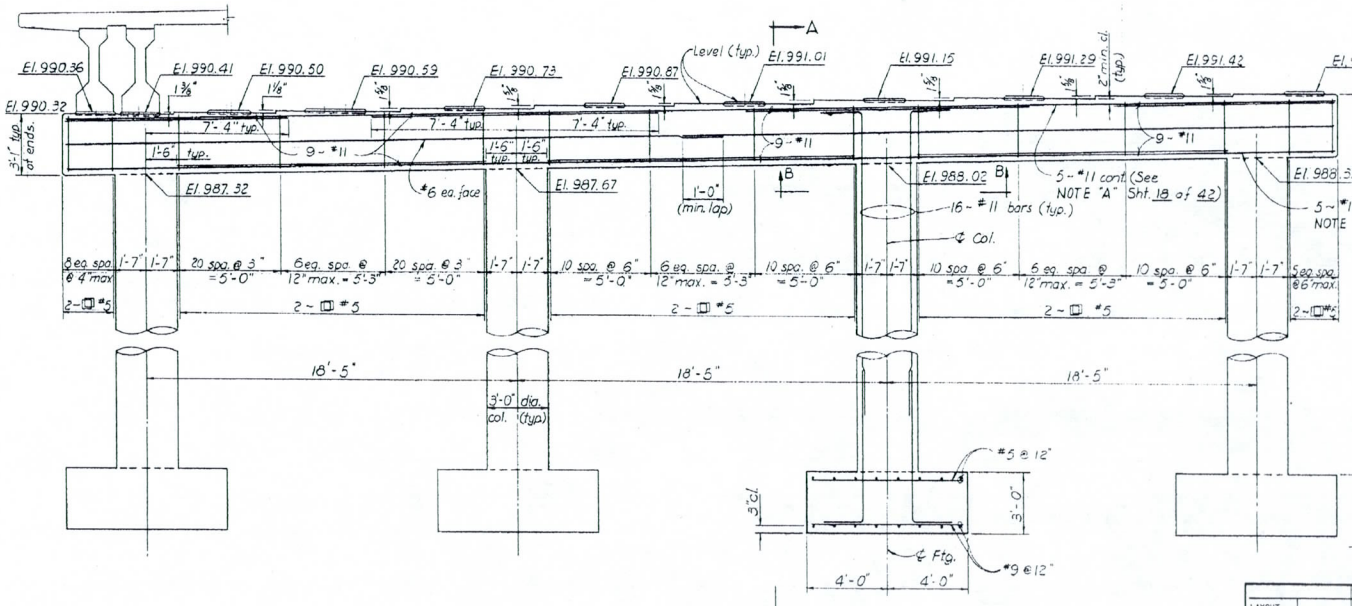
I-10 130/00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

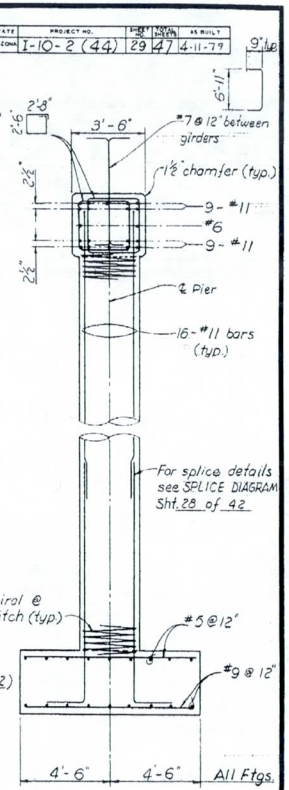
FORM NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	29	47	4-11-79



PLAN



ELEVATION AT ℄ PIER
Looking Ahead on Station



SECTION A-A

DO NOT DESTROY

NOTE:
For SECTION B-B see Sht. 28 of 42

		DATE
LAYOUT		
DESIGN	JJF	8-76
DESIGN CK'D	WSK	3-77
DRAWN	SEA	3-77
DWG CK'D	JJF	3-77
APPROVED	J. Miller	4-77

SHEET NO. 24 OF 42

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA 6867 +
AGUA FRIA RIVER BRIDGES
PIER No. 1 DETAILS W.B.

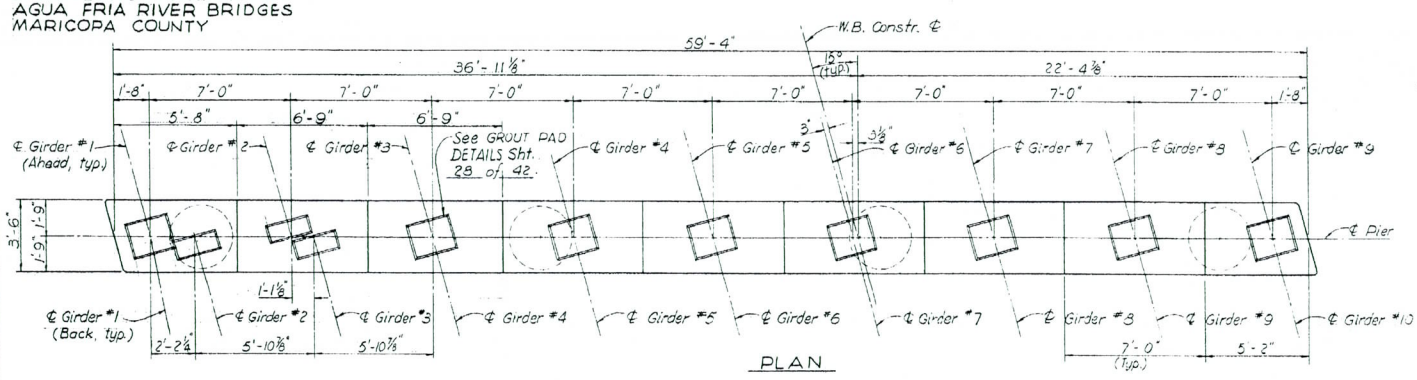
ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
I-10	Maricopa	E.B. 1853 W.B. 1855	I-10-2(44)

BRIDGE ENGINEER

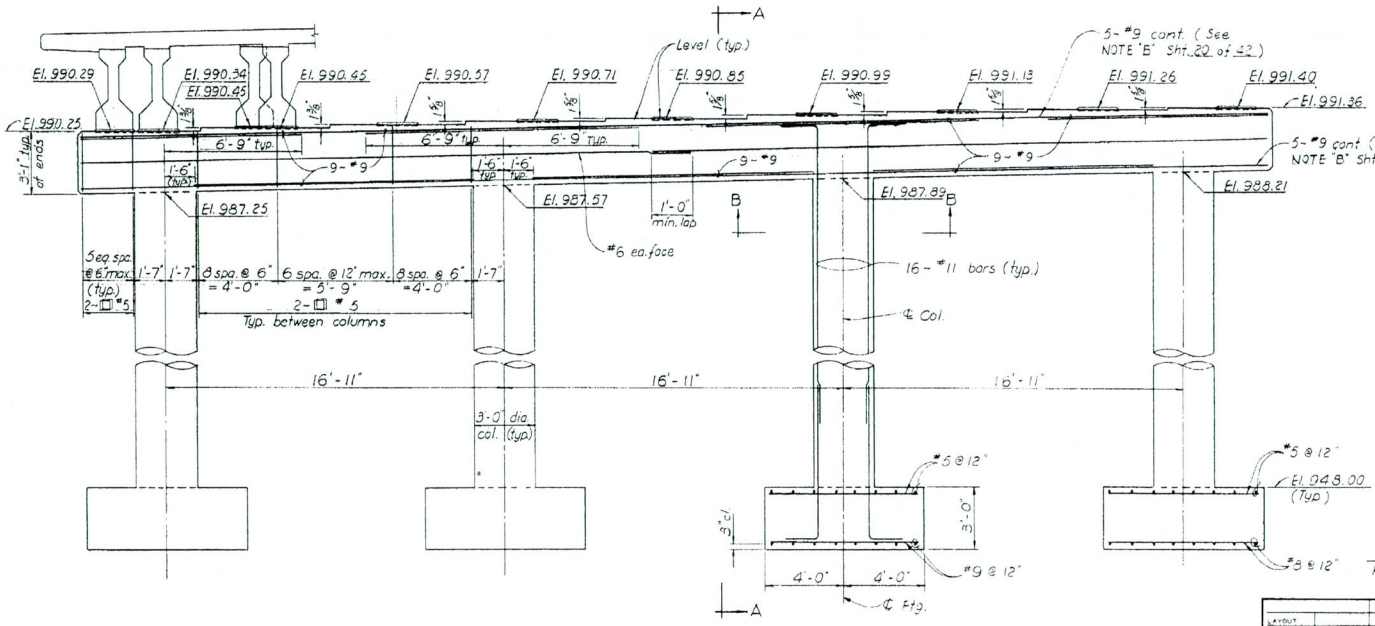
I-10 180.00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

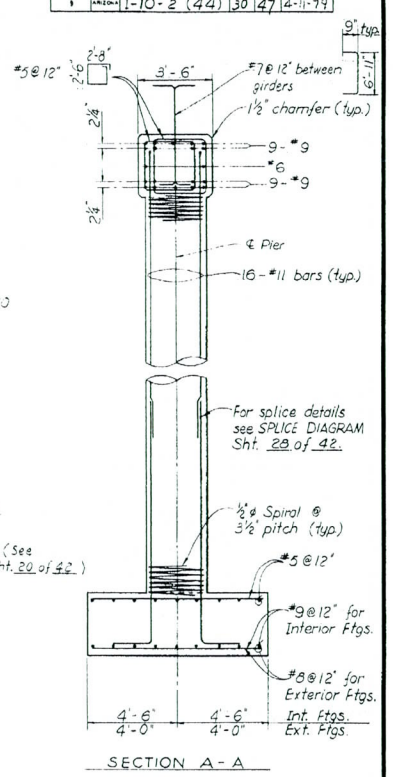
FORM NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
1	ARIZONA	I-10-2 (44)	30	47	4-11-74



PLAN



ELEVATION AT ℄ PIER
Looking Ahead on Station



SECTION A-A

NOTE:
For SECTION B-B see Sht. 28 of 42

		DATE
LAYOUT		
DESIGN	JJF	8-76
DESIGN CHKD	WSK	3-77
DRAWN	SEA	3-77
DRAWN CHKD	JJF	3-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

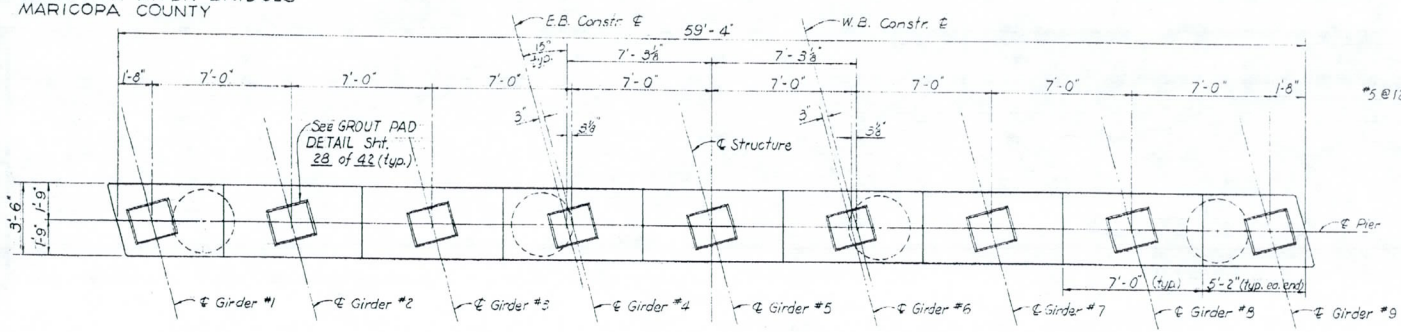
STA. 8867 +
AGUA FRIA RIVER BRIDGES
PIER No. 2 DETAILS W.B.

SHEET NO.	ROUTE	COUNTY	F.E.	W.B.	STRUCTURE NO.	PROJECT NUMBER
25 of 42	I-10	Maricopa	1373	1373		I-10-2 (44)

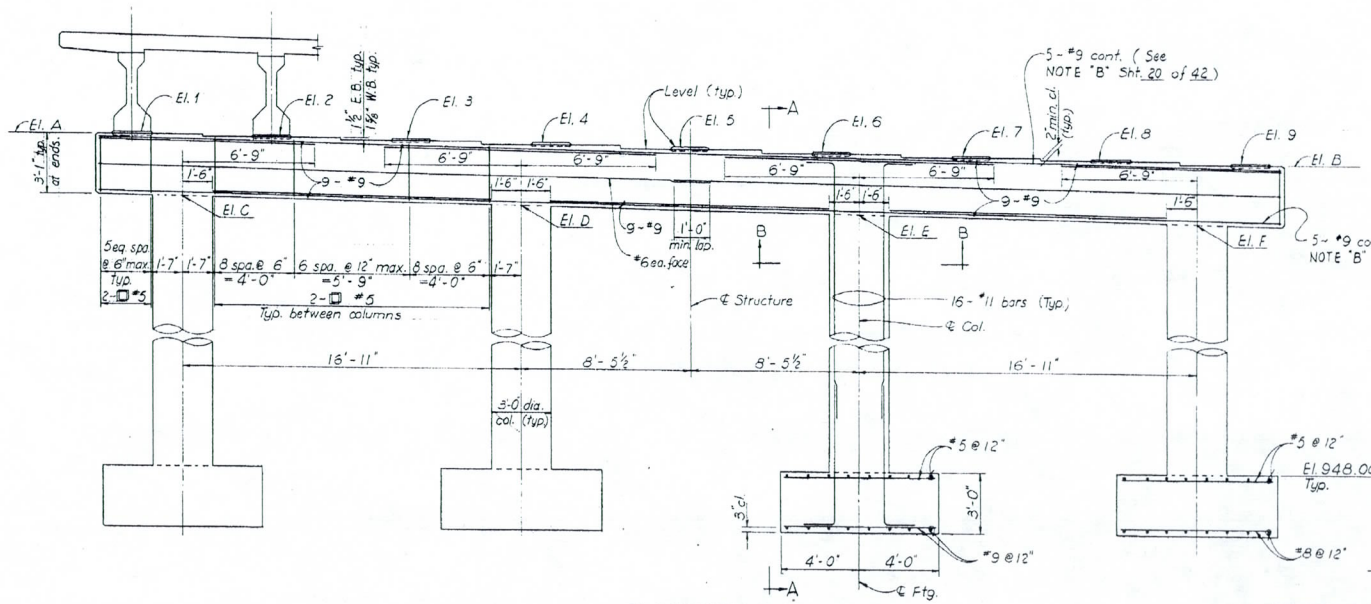
REGISTERED ENGINEER
No. 3151
ARIZONA
BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

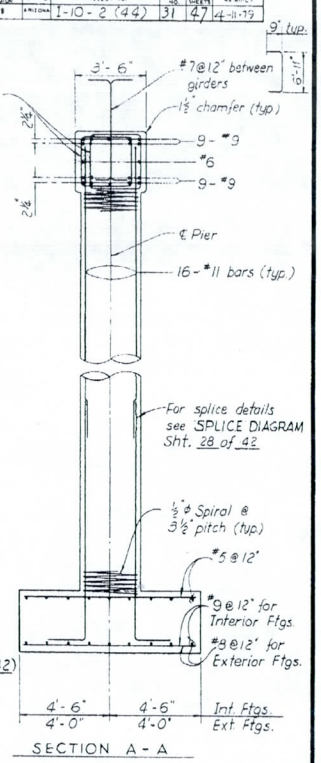
STATE	STATE	PROJECT NO.	SHEET NO.	TOTAL SHTS.	AS BUILT
8	ARIZONA	I-10-2 (44)	31	47	4-11-79



TYPICAL PIER PLAN
Piers No. 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19.



ELEVATION AT ℄ PIER
E.B. shown, W.B. similar except for slope.
(Looking Ahead on Station)



SECTION A - A

NOTE :
For SECTION B-B see Sht 28 of 42.

DO NOT RECYCLE

		DATE
LAYOUT		
DESIGN	JJF	8-76
DESIGN CK'D	WSK	9-77
DRAWN	SEA	9-77
DWG CK'D	JJF	9-77
APPROVED	J. Miller	9-77
SHEET NO.	26 of 42	

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

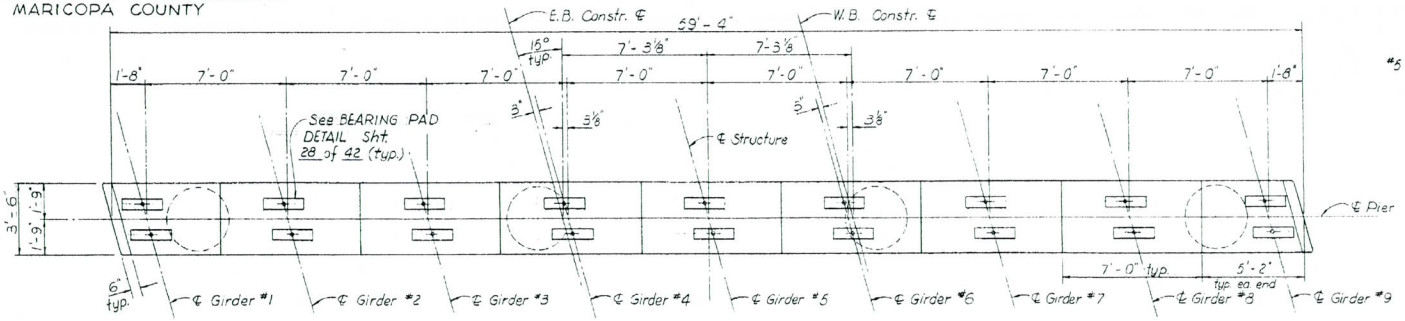
STA. 6867 +
AGUA FRIA RIVER BRIDGES
INTEGRAL PIER DETAILS E.B. & W.B.

ROUTE	COUNTY	F.A. PROJECT NO.	PROJECT NUMBER
I-10	Maricopa	E.B. 1332 W.B. 1284	I-10-2 (44)

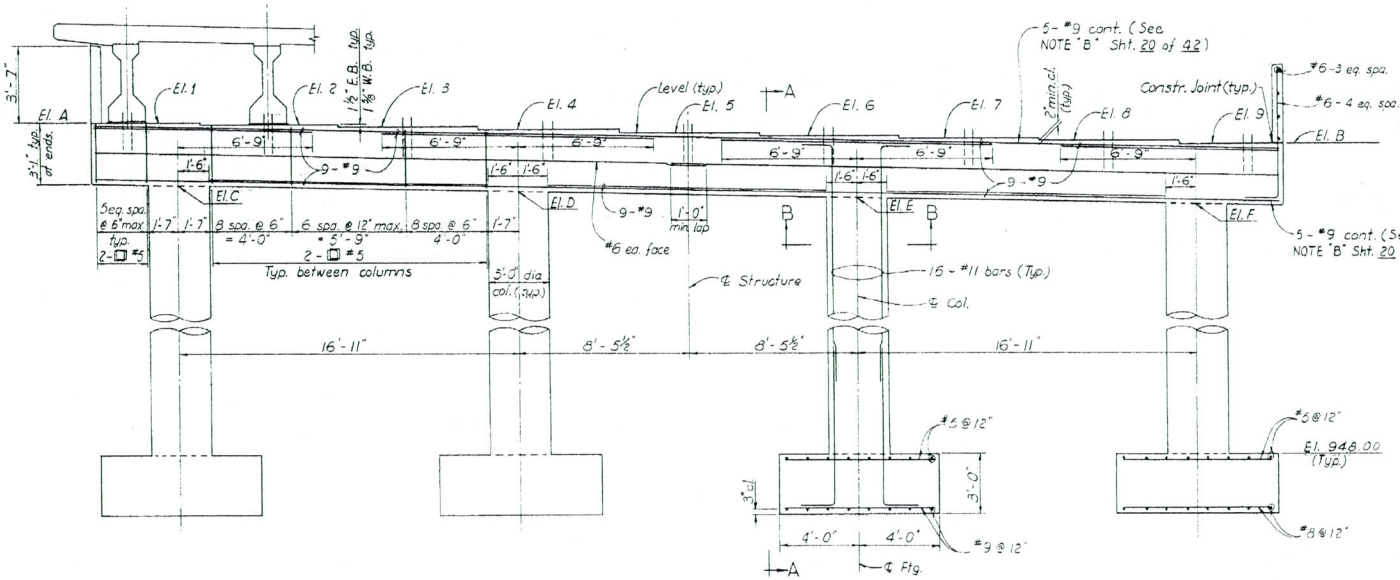
I-10 130.00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

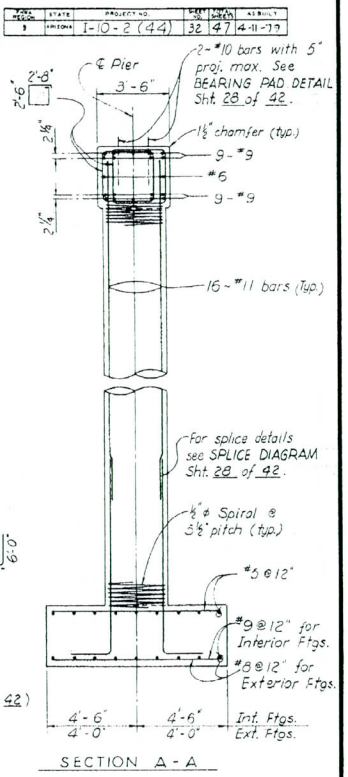
FED. ROAD	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	32	47	4-11-79



TYPICAL PIER PLAN
Piers No. 4, 8, 12 and 16



ELEVATION AT ℄ PIER
E.B. shown, W.B. similar except for slope.
(Looking Ahead on Station)



SECTION A-A

NOT TO SCALE

NOTE:
For SECTION B-B see Sht. 28 of 42

		DATE
LAYOUT		
DESIGN	JJF	8-76
DESIGN CHK'D	WSK	3-77
DRAWN	SEA	2-77
CHK'D	JJF	2-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867+
AGUA FRIA RIVER BRIDGES
EXPANSION PIER DETAILS EB & WB

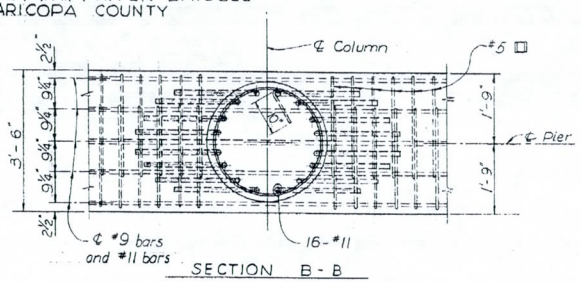
SHEET NO.	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
27 of 42	I-10	Maricopa	E.B. 1852 W.B. 1853	I-10-2(44)

BRIDGE ENGINEER

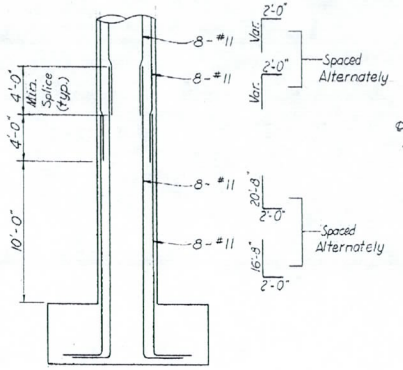
I-10 130.00

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

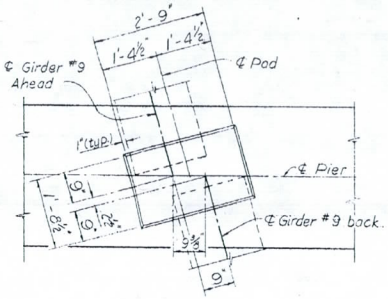
FEDERAL REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2 (44)	33	47	4-11-79



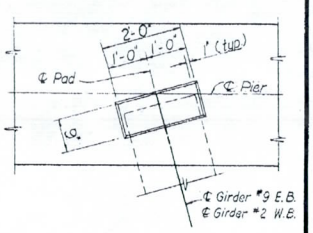
SECTION B-B



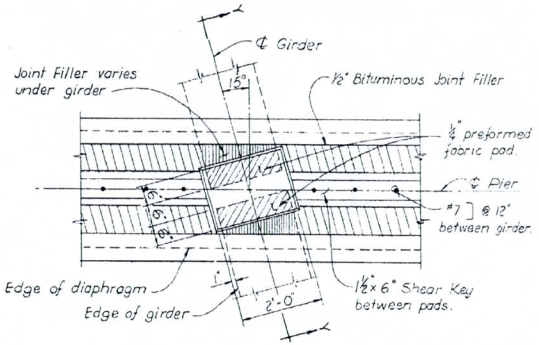
SPLICE DIAGRAM
(Typ. for all Columns)



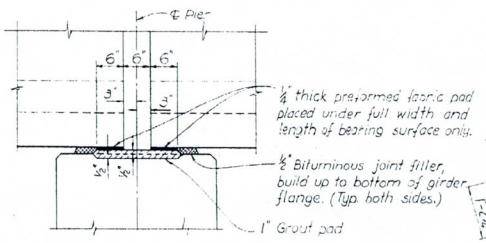
PIER No. 1 E.B.



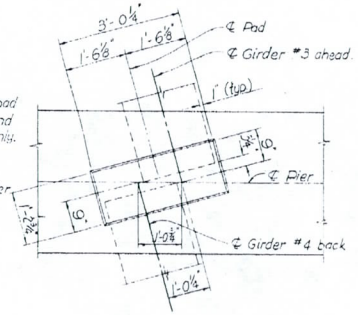
PIER No. 2 E.B.
PIER No. 1 W.B.
PIER No. 2 W.B.



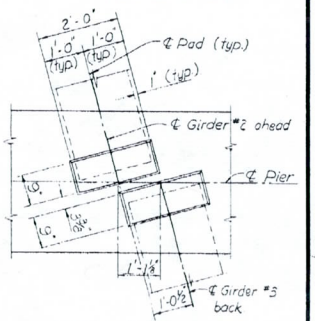
TYPICAL GROUT PAD DETAIL



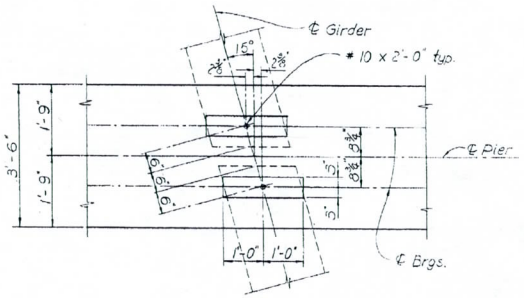
SECTION Y-Y



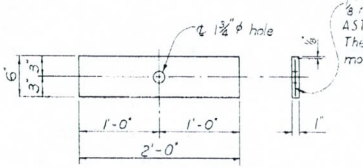
PIER No. 1 W.B.



PIER No. 2 W.B.



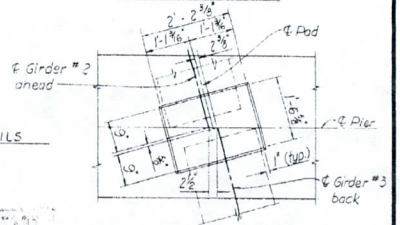
TYPICAL BEARING PAD DETAIL
(Piers #4, #8, #12 and #16)



NEOPRENE BEARING PAD DETAIL
Durometer Hardness 60
144 Required

SPECIAL GROUT PAD DETAILS

For all other details see TYPICAL GROUT PAD DETAILS this sheet.



PIER No. 1 W.B.

		DATE
LAYOUT		
DESIGN	J.I.F.	2-76
DESIGN CK'D	W.S.K.	3-77
DRAWN	S.E.A.	2-77
CHECKED	J.I.F.	3-77
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 6867 +
AGUA FRIA RIVER BRIDGES
PIER DETAILS E.B. & W.B.

SHEET NO.	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
28 of 42	I-10	Maricopa	E.B. 1852 W.B. 1853	I-10-2 (44)

KEITH DAVID MILLER
DEC. 31, 19
ARIZONA, U.S.A.
REGISTERED PROFESSIONAL ENGINEER
BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	34	47	4-11-79

TOP OF GROUT PAD ELEVATIONS EB

Pier	El. 1	El. 2	El. 3	El. 4	El. 5	El. 6	El. 7	El. 8	El. 9
Pier Nº 3	991.04	990.91	990.78	990.65	990.52	990.39	990.25	990.12	989.99
Pier Nº 4	990.82	990.69	990.56	990.43	990.30	990.17	990.03	989.90	989.77
Pier Nº 5	990.72	990.59	990.46	990.33	990.20	990.07	989.94	989.81	989.67
Pier Nº 6	990.56	990.43	990.30	990.17	990.04	989.91	989.78	989.65	989.52
Pier Nº 7	990.41	990.27	990.14	990.01	989.88	989.75	989.62	989.49	989.36
Pier Nº 8	990.18	990.05	989.92	989.79	989.66	989.53	989.40	989.27	989.13
Pier Nº 9	990.09	989.96	989.82	989.69	989.56	989.43	989.30	989.17	989.04
Pier Nº 10	989.93	989.80	989.67	989.53	989.40	989.27	989.14	989.01	988.88
Pier Nº 11	989.77	989.64	989.51	989.37	989.24	989.11	988.98	988.85	988.72
Pier Nº 12	989.55	989.42	989.28	989.15	989.02	988.89	988.76	988.63	988.50
Pier Nº 13	989.45	989.32	989.19	989.06	988.93	988.79	988.66	988.53	988.40
Pier Nº 14	989.29	989.16	989.03	988.90	988.77	988.63	988.50	988.37	988.24
Pier Nº 15	989.13	989.00	988.87	988.74	988.61	988.48	988.34	988.21	988.08
Pier Nº 16	988.91	988.78	988.65	988.52	988.38	988.25	988.12	987.99	987.86
Pier Nº 17	988.81	988.68	988.55	988.42	988.29	988.16	988.03	987.89	987.76
Pier Nº 18	988.65	988.52	988.39	988.26	988.13	988.00	987.87	987.74	987.60
Pier Nº 19	988.49	988.36	988.23	988.10	987.97	987.84	987.71	987.58	987.44

TOP OF GROUT PAD ELEVATIONS WB

Pier	El. 1	El. 2	El. 3	El. 4	El. 5	El. 6	El. 7	El. 8	El. 9
Pier Nº 3	990.14	990.27	990.41	990.55	990.69	990.83	990.97	991.11	991.25
Pier Nº 4	989.91	990.05	990.19	990.33	990.47	990.61	990.75	990.89	991.02
Pier Nº 5	989.82	989.96	990.10	990.23	990.37	990.51	990.65	990.79	990.93
Pier Nº 6	989.66	989.80	989.94	990.07	990.21	990.35	990.49	990.63	990.77
Pier Nº 7	989.50	989.64	989.78	989.92	990.05	990.19	990.33	990.47	990.61
Pier Nº 8	989.28	989.42	989.56	989.70	989.83	989.97	990.11	990.25	990.39
Pier Nº 9	989.18	989.32	989.46	989.60	989.74	989.88	990.01	990.15	990.29
Pier Nº 10	989.02	989.16	989.30	989.44	989.58	989.72	989.85	989.99	990.13
Pier Nº 11	988.86	989.00	989.14	989.28	989.42	989.56	989.70	989.83	989.97
Pier Nº 12	988.64	988.78	988.92	989.06	989.20	989.34	989.48	989.61	989.75
Pier Nº 13	988.54	988.68	988.82	988.96	989.10	989.24	989.38	989.52	989.66
Pier Nº 14	988.38	988.52	988.66	988.80	988.94	989.08	989.22	989.36	989.50
Pier Nº 15	988.23	988.37	988.50	988.64	988.78	988.92	989.06	989.20	989.34
Pier Nº 16	988.01	988.14	988.28	988.42	988.56	988.70	988.84	988.98	989.12
Pier Nº 17	987.91	988.05	988.19	988.32	988.46	988.60	988.74	988.88	989.02
Pier Nº 18	987.75	987.89	988.03	988.17	988.30	988.44	988.58	988.72	988.86
Pier Nº 19	987.59	987.73	987.87	988.01	988.15	988.28	988.42	988.56	988.70

PIER ELEVATIONS EB

Pier	El. A	El. B	El. C	El. D	El. E	El. F
Pier Nº 3	991.00	989.95	987.85	987.55	987.25	986.95
Pier Nº 4	990.82	989.77	987.66	987.36	987.06	986.76
Pier Nº 5	990.68	989.63	987.52	987.22	986.92	986.62
Pier Nº 6	990.52	989.48	987.36	987.06	986.76	986.46
Pier Nº 7	990.37	989.29	987.21	986.91	986.61	986.31
Pier Nº 8	990.18	989.13	987.02	986.72	986.42	986.12
Pier Nº 9	990.05	989.00	986.89	986.59	986.29	985.99
Pier Nº 10	989.89	988.84	986.73	986.43	986.13	985.83
Pier Nº 11	989.73	988.68	986.57	986.27	985.97	985.67
Pier Nº 12	989.55	988.50	986.39	986.09	985.79	985.49
Pier Nº 13	989.41	988.36	986.25	985.95	985.65	985.35
Pier Nº 14	989.25	988.20	986.09	985.79	985.49	985.19
Pier Nº 15	989.09	988.04	985.93	985.63	985.33	985.03
Pier Nº 16	988.91	987.86	985.75	985.45	985.15	984.85
Pier Nº 17	988.77	987.72	985.61	985.31	985.01	984.71
Pier Nº 18	988.61	987.56	985.45	985.15	984.85	984.55
Pier Nº 19	988.45	987.40	985.29	984.99	984.69	984.39

PIER ELEVATIONS WB

Pier	El. A	El. B	El. C	El. D	El. E	El. F
Pier Nº 3	990.10	991.21	987.10	987.42	987.74	988.06
Pier Nº 4	989.91	991.02	986.91	987.23	987.55	987.87
Pier Nº 5	989.78	990.89	986.78	987.10	987.42	987.74
Pier Nº 6	989.62	990.73	986.62	986.94	987.26	987.58
Pier Nº 7	989.46	990.57	986.46	986.78	987.10	987.42
Pier Nº 8	989.28	990.39	986.28	986.60	986.92	987.24
Pier Nº 9	989.14	990.25	986.14	986.46	986.78	987.10
Pier Nº 10	988.98	990.09	985.98	986.30	986.62	986.94
Pier Nº 11	988.82	989.93	985.82	986.14	986.46	986.78
Pier Nº 12	988.64	989.75	985.64	985.96	986.28	986.60
Pier Nº 13	988.50	989.62	985.50	985.82	986.14	986.46
Pier Nº 14	988.34	989.46	985.34	985.66	985.98	986.30
Pier Nº 15	988.19	989.30	985.19	985.51	985.83	986.15
Pier Nº 16	988.01	989.12	985.01	985.33	985.65	985.97
Pier Nº 17	987.87	989.98	984.87	985.19	985.51	985.83
Pier Nº 18	987.71	989.82	984.71	985.03	985.35	985.67
Pier Nº 19	987.55	989.66	984.55	984.87	985.19	985.51

		DATE
LAYOUT		
DESIGN	J.J.F	8-76
DESIGNED	W.S.K	3-77
DRAWN	C.A.B	3-77
CHECKED	J.J.F	4-77
APPROVED	L. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

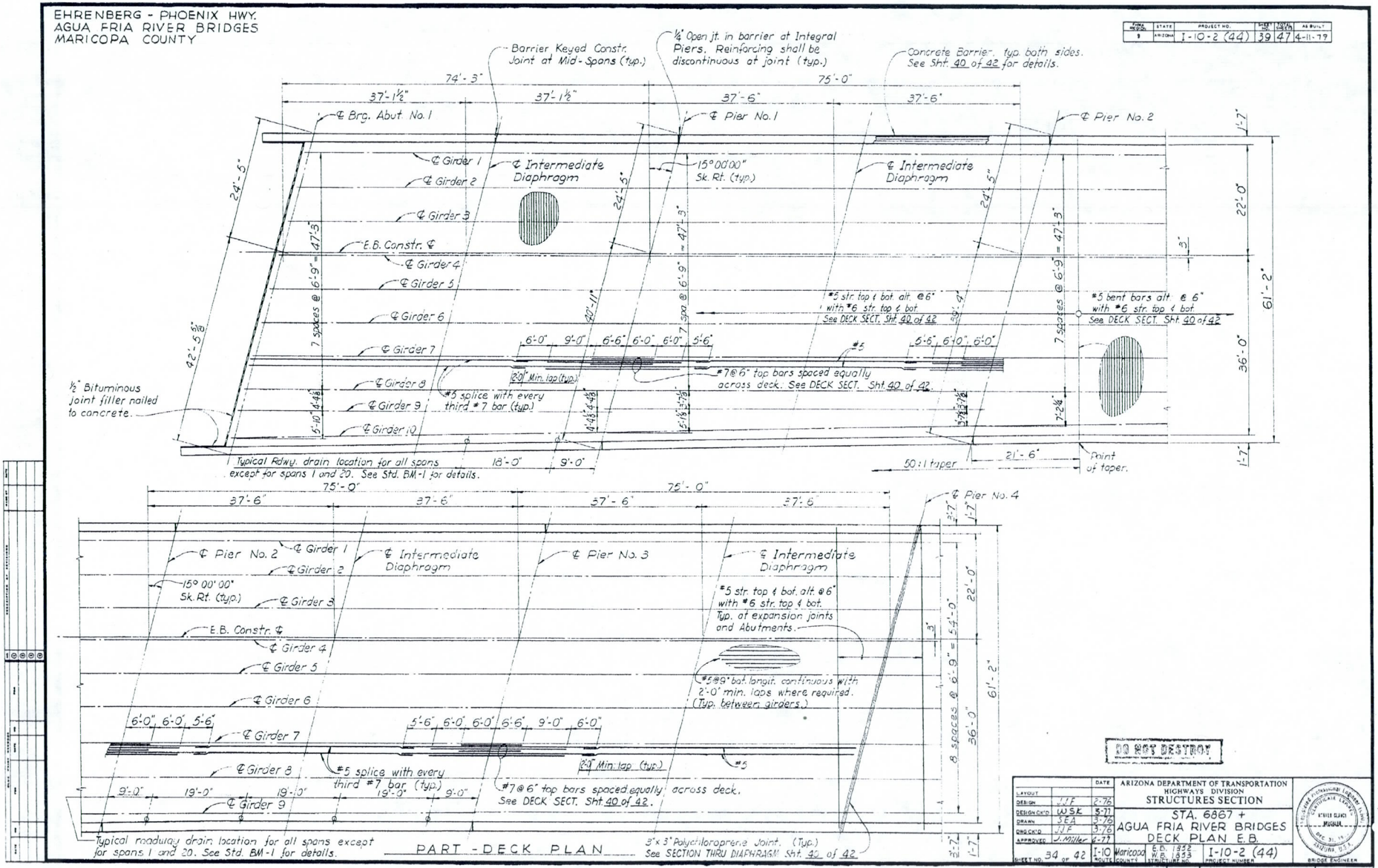
STA 686?+
AGUA FRIA RIVER BRIDGES
PIER ELEVATIONS EB&WB

SHEET NO.	OF	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
29	42	I-10	Maricopa	EB 1852 WB 1853	I-10-2(44)

BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FUNC. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
8	ARIZONA	I-10-2 (44)	39	47	4-11-79



PART - DECK PLAN

DO NOT DESTROY

		DATE
LAYOUT		
DESIGN	J.J.F.	2-78
DESIGN CK'D	W.S.K.	3-77
DRAWN	S.E.A.	3-76
CHECK'D	J.J.F.	3-76
APPROVED	J. Miller	6-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 6867 +
AGUA FRIA RIVER BRIDGES
DECK PLAN E.B.

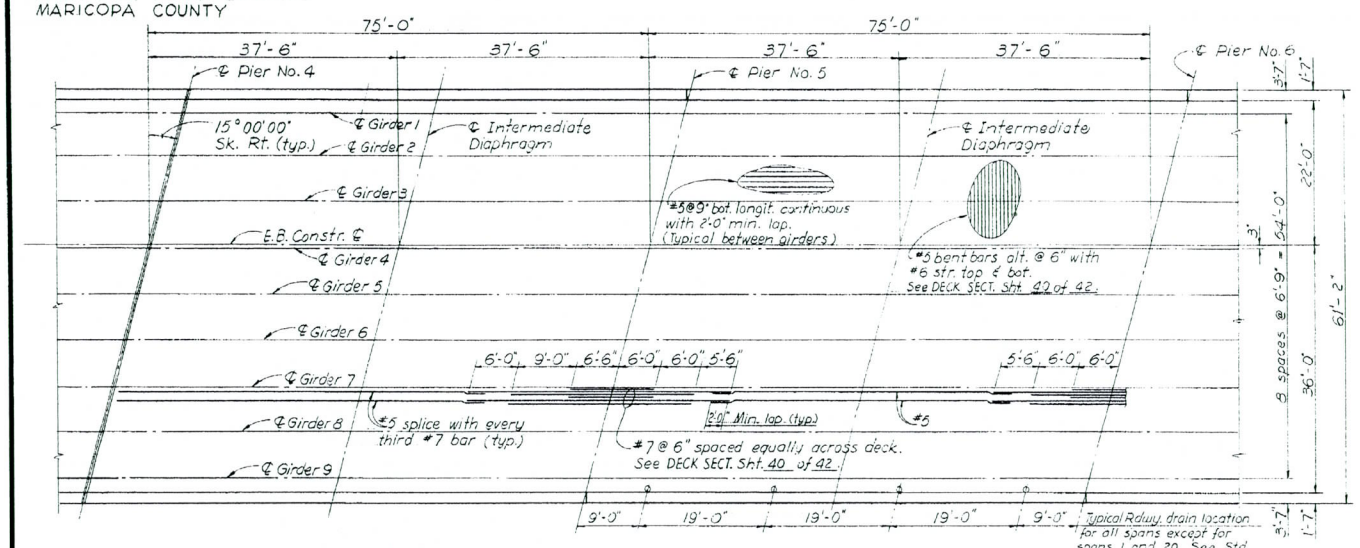
SHEET NO.	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
34 OF 42	I-10	Maricopa	E.B. 1858 W.B. 1859	I-10-2 (44)

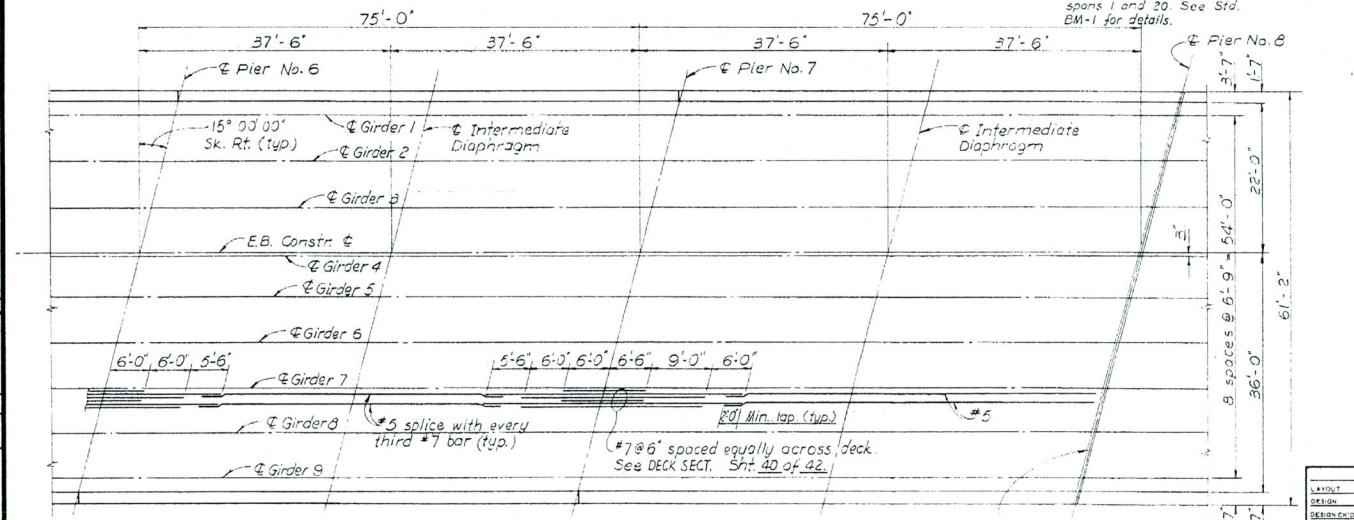
BRIDGE ENGINEER

I-10 130-20

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FUND ACCOUNT	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	40	47	4-11-79





PART - DECK PLAN

Deck Plan for Piers # 9 thru #12 and #12 thru #16
Similar to Piers #4 thru #8

		DATE
LAYOUT		
DESIGN	JJF	2-76
DESIGN CK'D	WSK	5-77
DRAWN	SEA	7-76
CHECK'D	JJF	2-76
APPROVED	J. Miller	4-77
SHEET NO. 35 OF 42		

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

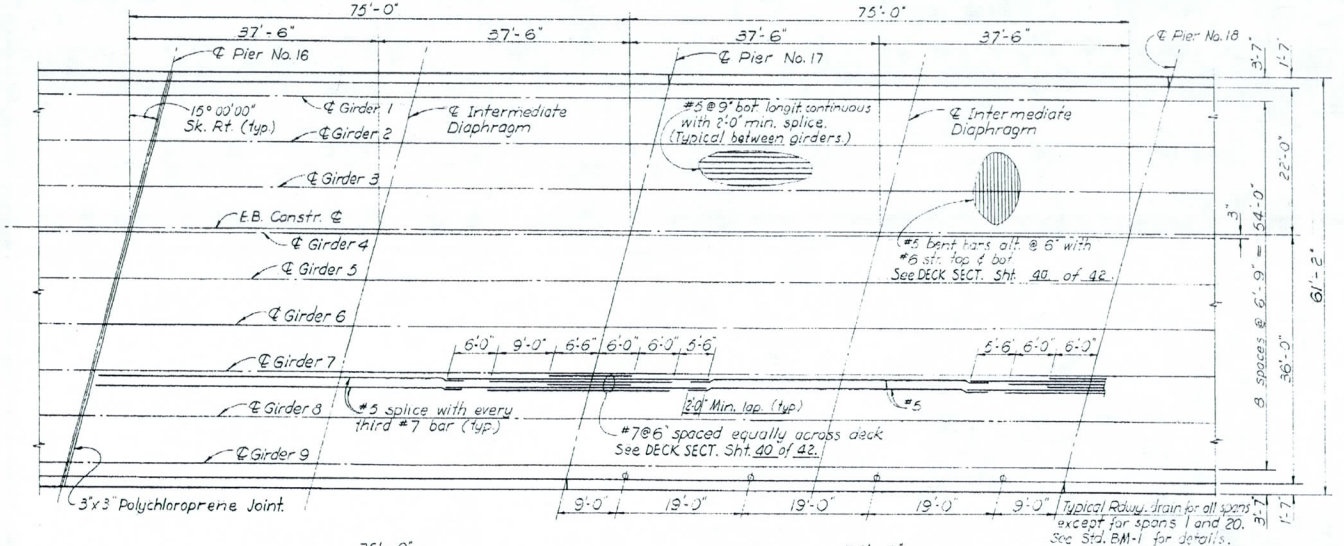
STA. 6867 +
AGUA FRIA RIVER BRIDGES
DECK PLAN E.B.

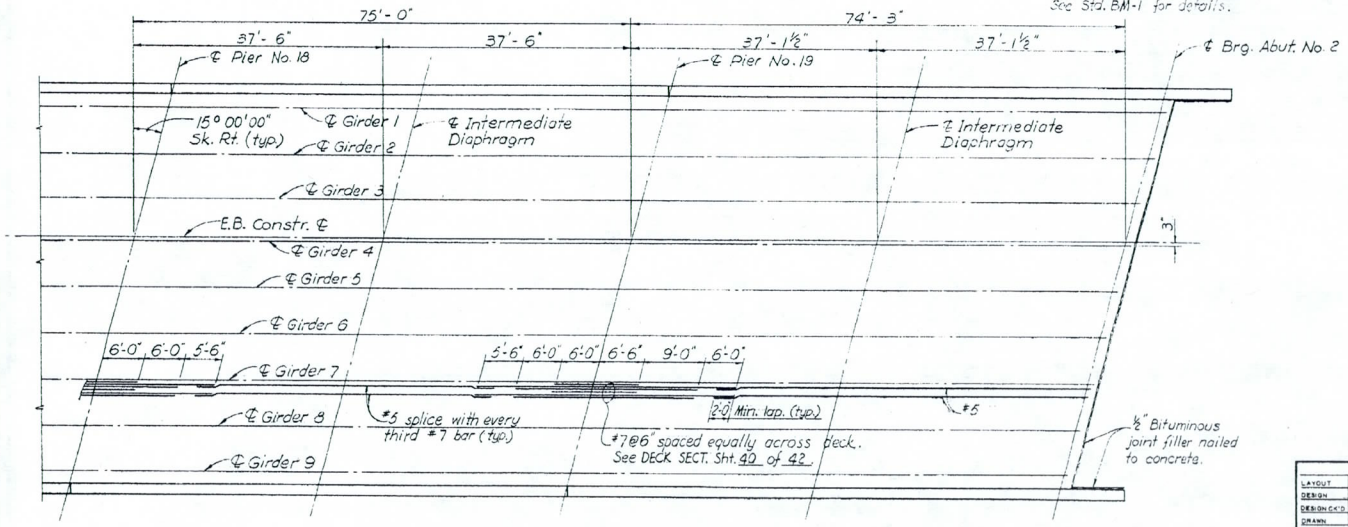
I-10	Maricopa	1852	I-10-2(44)
ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER

BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FUNC. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	41	47	4-1 79





PART - DECK PLAN

SO NOT DESTROY

		DATE
LAYOUT		
DESIGN	JJE	2-76
DESIGN CK'D	WSK	5-77
DRAWN	SEA	5-76
DWG CK'D	JJE	5-76
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867 +
AGUA FRIA RIVER BRIDGES
DECK PLAN E.B.

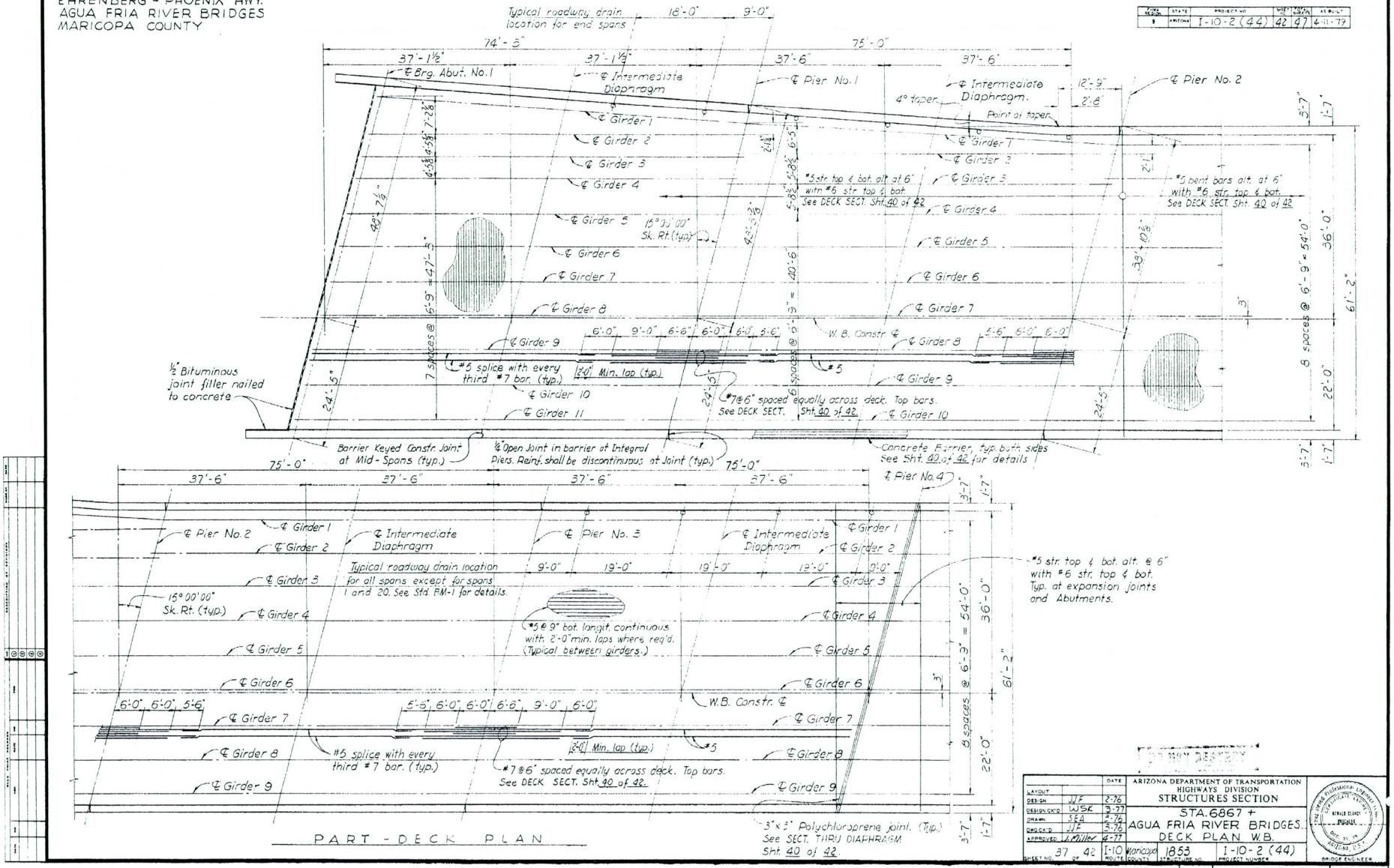
SHEET NO. 36 OF 42 | I-10 ROUTE | Maricopa COUNTY | 1852 STRUCTURE NO. | I-10-2(44) PROJECT NUMBER

BRIDGE ENGINEER

137
141

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FHWA REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	42	47	4-11-77



PART - DECK PLAN

FOR NEW DESIGN

		DATE
LAYOUT		
DESIGN	JJF	2-76
DESIGN CK'D	WJSR	3-77
DRAWN	SEA	3-76
CHECK'D	JJF	5-76
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

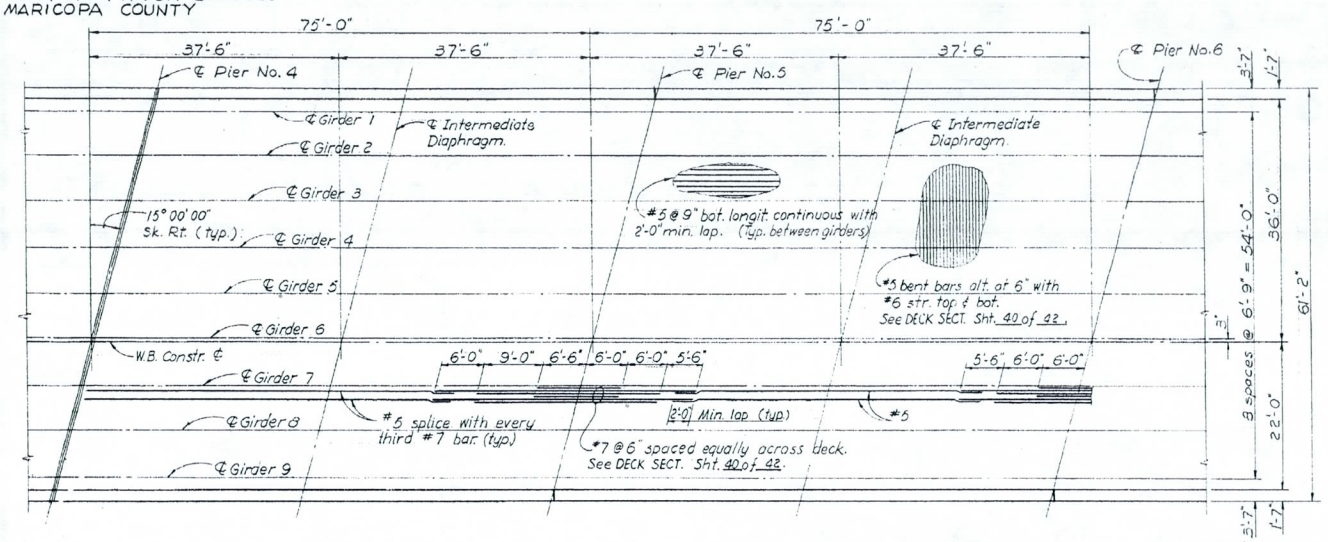
STA. 6867 +
AGUA FRIA RIVER BRIDGES
DECK PLAN W.B.

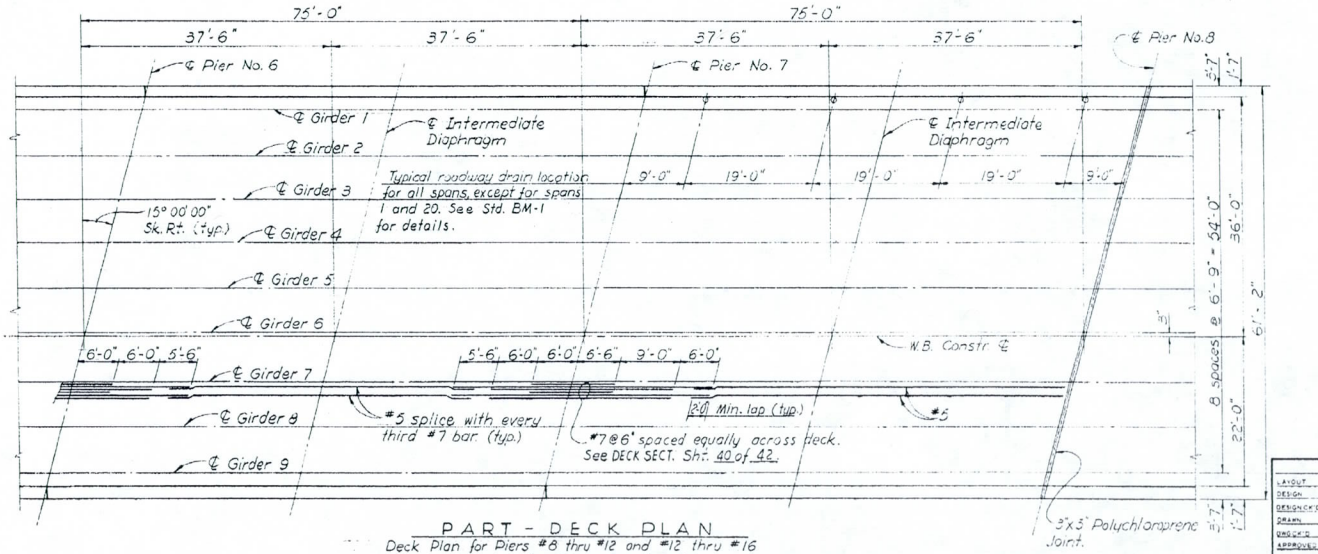
SHEET NO. 37 OF 42 | I-10 ROUTE | Maricopa COUNTY | 1853 STRUCTURE NO. | I-10-2(44) PROJECT NUMBER

STATE OF ARIZONA — DEC. 31, 19 — REGISTERED PROFESSIONAL ENGINEER — BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	43	47	4-11-79





PART - DECK PLAN
Deck Plan for Piers #8 thru #12 and #12 thru #16
Similar to Piers #4 thru #8

		DATE
LAYOUT		
DESIGN	JJF	2-76
DESIGN'D	WSK	3-77
DRAWN	SEA	3-76
CHECK'D	JJF	3-76
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867+
AGUA FRIA RIVER BRIDGES
DECK PLAN W.B.

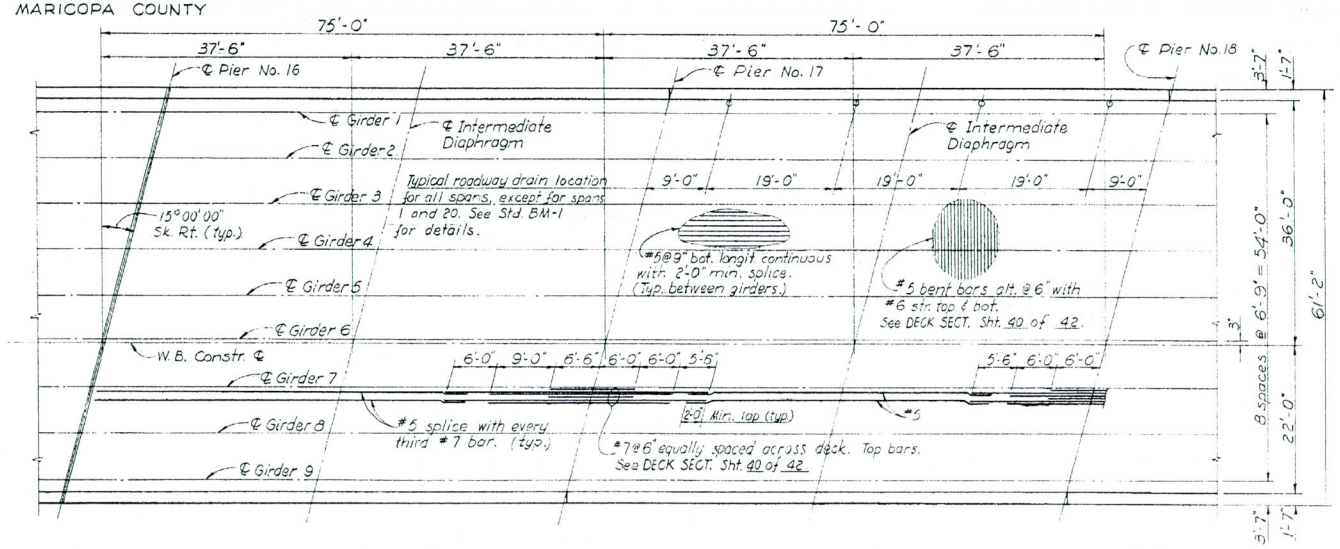
SHEET NO.	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
38 of 42	I-10	Maricopa	1853	I-10-2(44)

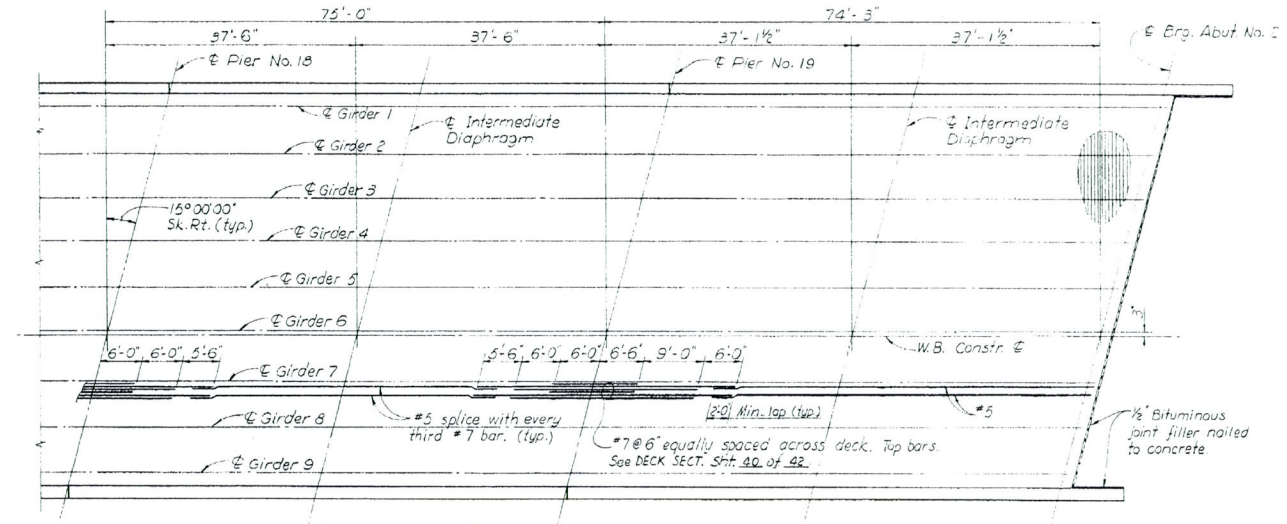
BRIDGE ENGINEER

I no 1000

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

FUND PROJ.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	44	47	4-11-79





PART - DECK PLAN

		DATE
LAYOUT		
DESIGN	JJF	2-76
DESIGN CHK'D	WSK	3-77
DRAWN	SEA	3-76
CHECK'D	JJF	3-76
APPROVED	L.A. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 6867 +
AGUA FRIA RIVER BRIDGES
DECK PLAN W.B.

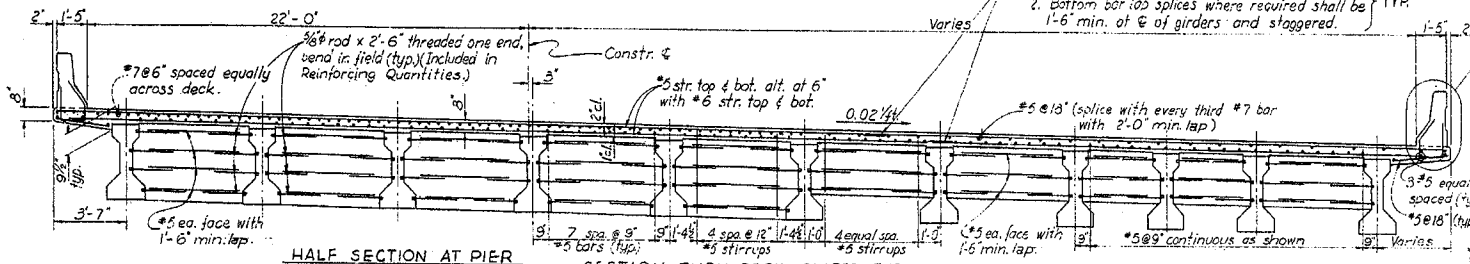
SHEET NO.	ROUTE	COUNTY	STRUCTURE NO.	PROJECT NUMBER
39 of 42	I-10	Maricopa	1853	I-10-2(44)

BRIDGE ENGINEER

EHRENBERG - PHOENIX HWY.
AGUA FRIA RIVER BRIDGES
MARICOPA COUNTY

NBIS REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA	I-10-2(44)	45	47	41-79

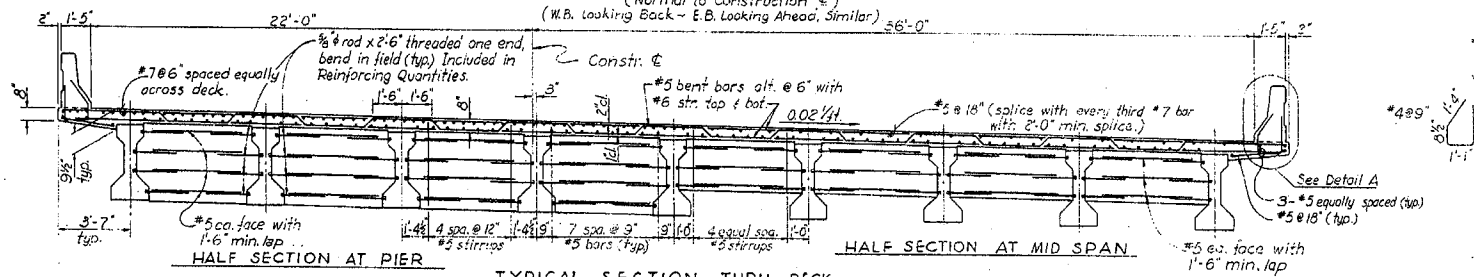
NOTE:
1. Top bar lap splices where required shall be 1'-6" min. at ℄ slab span.
2. Bottom bar lap splices where required shall be 1'-6" min. at ℄ of girders and staggered. } TYP.



HALF SECTION AT PIER

SECTION THRU DECK - FLARED END
(Normal to Construction ℄)
(W.B. Looking Back ~ E.B. Looking Ahead, Similar)

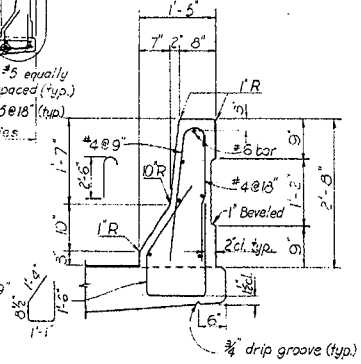
HALF SECTION AT MID SPAN



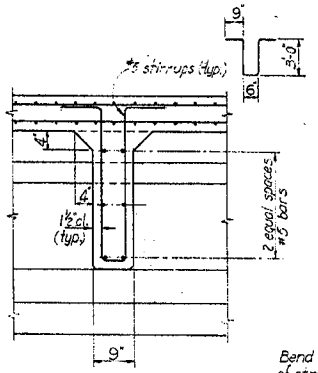
HALF SECTION AT PIER

TYPICAL SECTION THRU DECK
(Normal to Construction ℄)
(W.B. Looking Back - E.B. Looking Ahead)

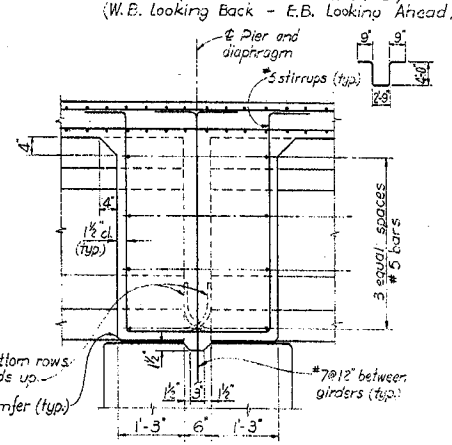
HALF SECTION AT MID SPAN



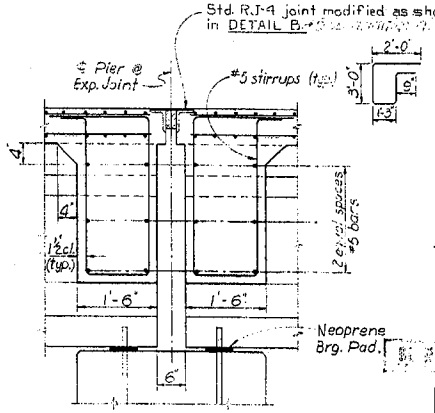
DETAIL A



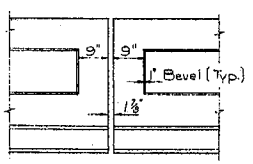
SECTION THRU INTERMEDIATE DIAPHRAGM



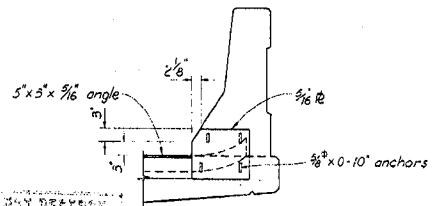
SECTION THRU DIAPHRAGM
At Integral Piers



SECTION THRU DIAPHRAGM
At Expansion Joint Piers



BARRIER EXP. JOINT DETAIL
Piers #4, #8, #12 and #16 only.



DETAIL B

		DATE
LAYOUT		
DESIGN	JJE	6-76
DESIGNED	WSK	3-77
DRAWN	SEA	6-76
CHECKED	JJE	6-76
APPROVED	J. Miller	4-77

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION
STA. 6867+
AGUA FRIA RIVER BRIDGES
DECK DETAILS EB&WB.

SHEET NO. 40 OF 42 | I-10 Maricopa (ROUTE COUNTY) | S.B. 1822 W.B. 1855 (STRUCTURE NO.) | I-10-2 (44) (PROJECT NUMBER)

BRIDGE ENGINEER

I-10-2(44)

APPENDIX K

PROJECT PHOTOS

Estrella_ParkwayTI_01_LookingEast_Ramp_C_Terminus.JPG

Estrella_ParkwayTI_02_LookingEast_Ramp_C_Terminus.JPG

Estrella_ParkwayTI_03_LookingEast_Ramp_C.JPG

Estrella_ParkwayTI_04_LookingEast_Ramp_C.JPG

Estrella_ParkwayTI_05_LookingEast_Ramp_C.JPG

Estrella_ParkwayTI_06.JPG

Estrella_ParkwayTI_07_LookingWest_OutfallSD_Estrella&Private_Development.JPG

Estrella_ParkwayTI_08_LookingEast_Outfall_D_Estrella&Private_Development.JPG

Estrella_ParkwayTI_09_LookingEast_Ramp_A_Inlet_of_Pipe_to_Basin.JPG

Estrella_ParkwayTI_10_LookingNorth_Ramp_A_Inlet_of_Pipe_to_Basin.JPG

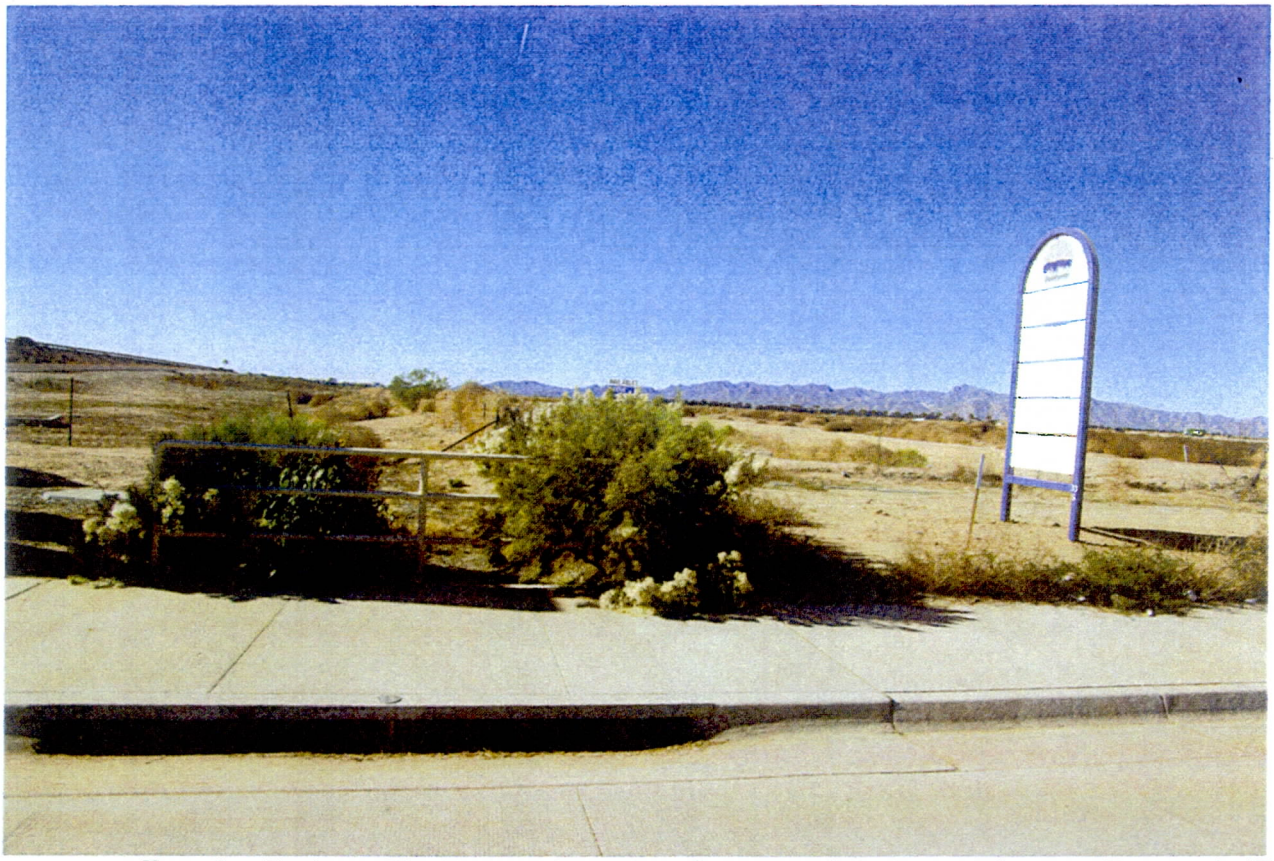
Estrella_ParkwayTI_11_LookingWest_Ramp_A_Inlet_of_Pipe_to_Basin.JPG

Estrella_ParkwayTI_12_Developer_Northwest_Quadrant_Ramp_A.JPG

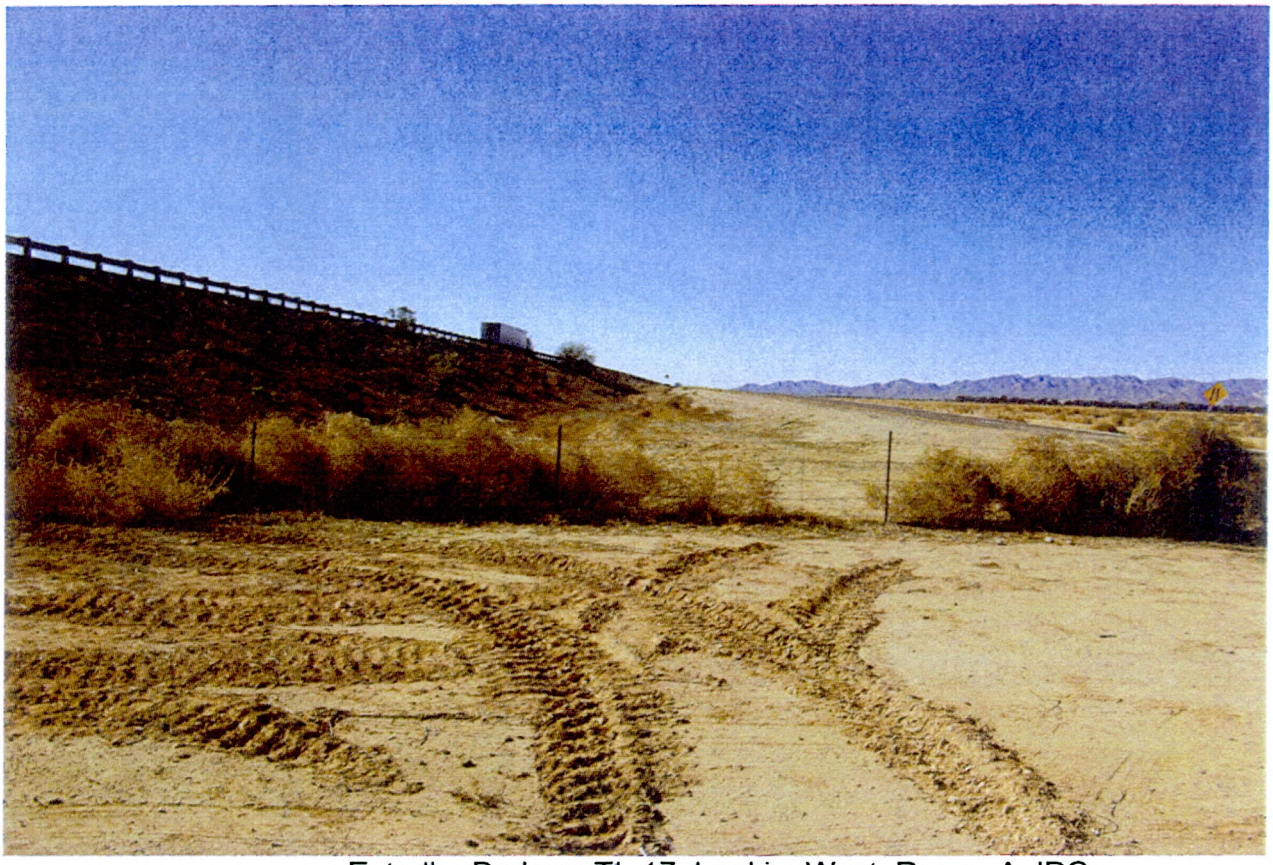
Estrella_ParkwayTI_13_Basin_on_PrivateLand_NorthwestCorner_Ramp_A.JPG

Estrella_ParkwayTI_14_LookingEast_Scupper_Southwest_Corner_Ramp_A.JPG

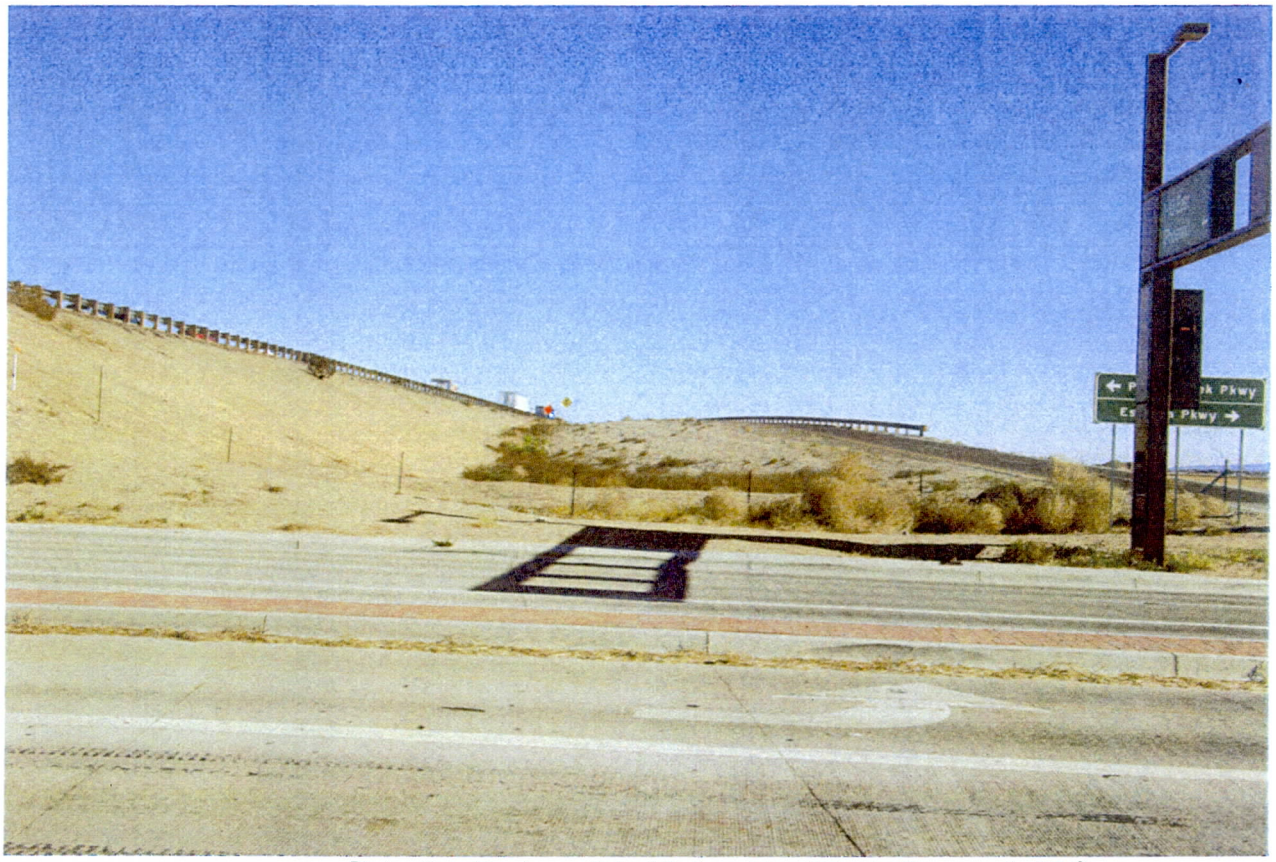
Estrella_ParkwayTI_15_LookingWest_Scupper_Southwest_Corner_Ramp_A.JPG



Estrella_ParkwayTI_16_LookingWest_Scupper_Southwest_Corner_Ramp_A.JPG



Estrella_ParkwayTI_17_LookingWest_Ramp_A.JPG



Estrella_ParkwayTI_18_LookingWest_Ramp_A.JPG

Estrella_ParkwayTI_19_LookingEast_Ramp_C.JPG

Estrella_ParkwayTI_20_LookingEast_Ramp_C.JPG

Estrella_ParkwayTI_21_lookingSouth_from_Ramp_D_Terminus.JPG

Estrella_ParkwayTI_22_LookingEast_Ramp_D.JPG

Estrella_ParkwayTI_23_LookingSouth_from_Ramp_D_terminus.JPG

Estrella_ParkwayTI_24_LookingEast_Ramp_D.JPG

Estrella_ParkwayTI_25_LookingWest_Ramp_B.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_01_LookingSouth_at_I-10.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_02LookingNorth_from_I-10.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_03_LookingNorth_from_I-10.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_04_LookingNorth_from_I-10.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_05_LookingNorth_BasinOutlet.JPG

Bullard_WashPrivate_ConstructionNorth_of_I-10_06_LookingSouth_BasinOutlet.JPG

Litchfield_RoadTI_01_LookingWest_Ramp_B.JPG

Litchfield_RoadTI_02_LookingEast_at_Ramp_D.JPG

Litchfield_RoadTI_03_LookingWest_at_Ramp_B.JPG

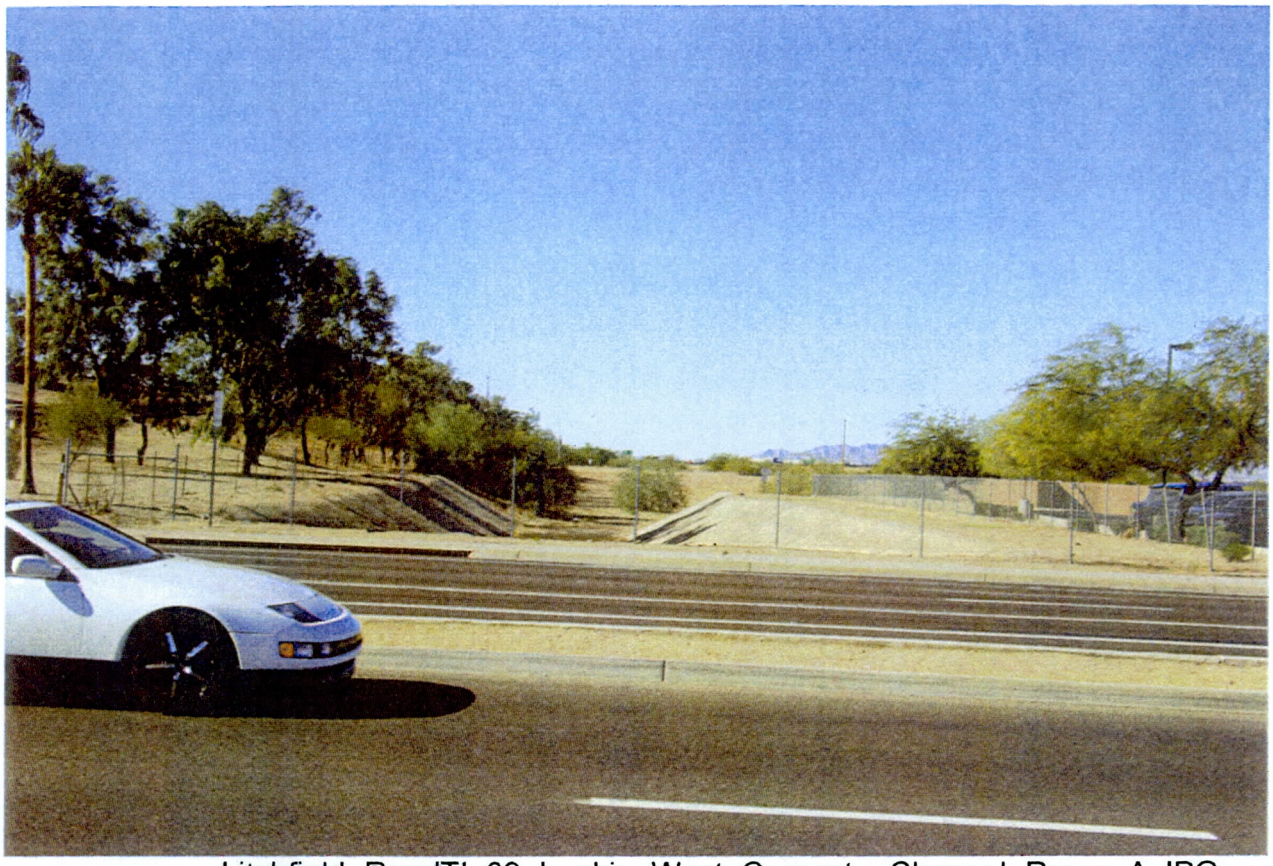
Litchfield_RoadTI_04_LookingEast_Ramp_D.JPG

Litchfield_RoadTI_05_LookingEast_Ramp_D.JPG

Litchfield_RoadTI_06_LookingSouthWest_Ramp_A.JPG

Litchfield_RoadTI_07_LookingWest_Ramp_A.JPG

Litchfield_RoadTI_08_LookingEast_Concrete_Channel_Ramp_C.JPG



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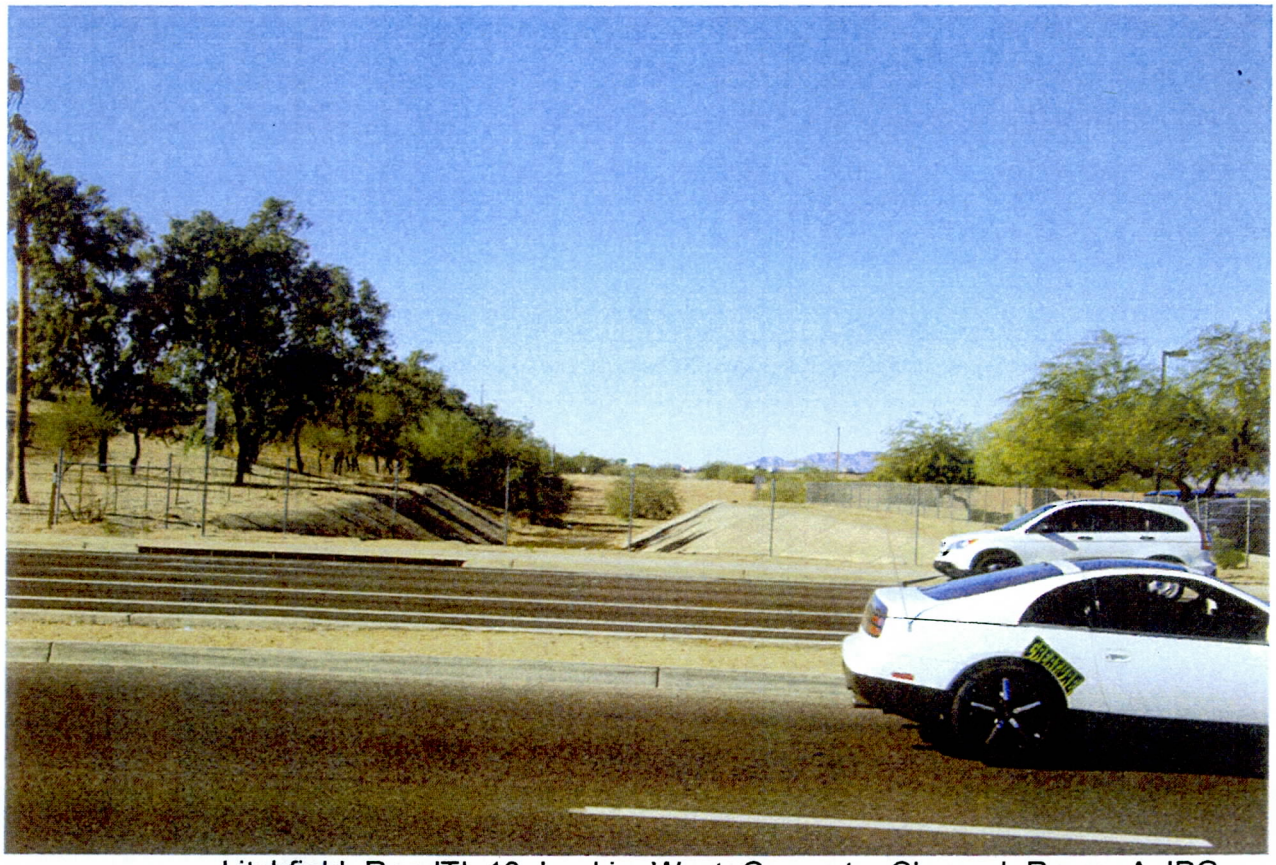
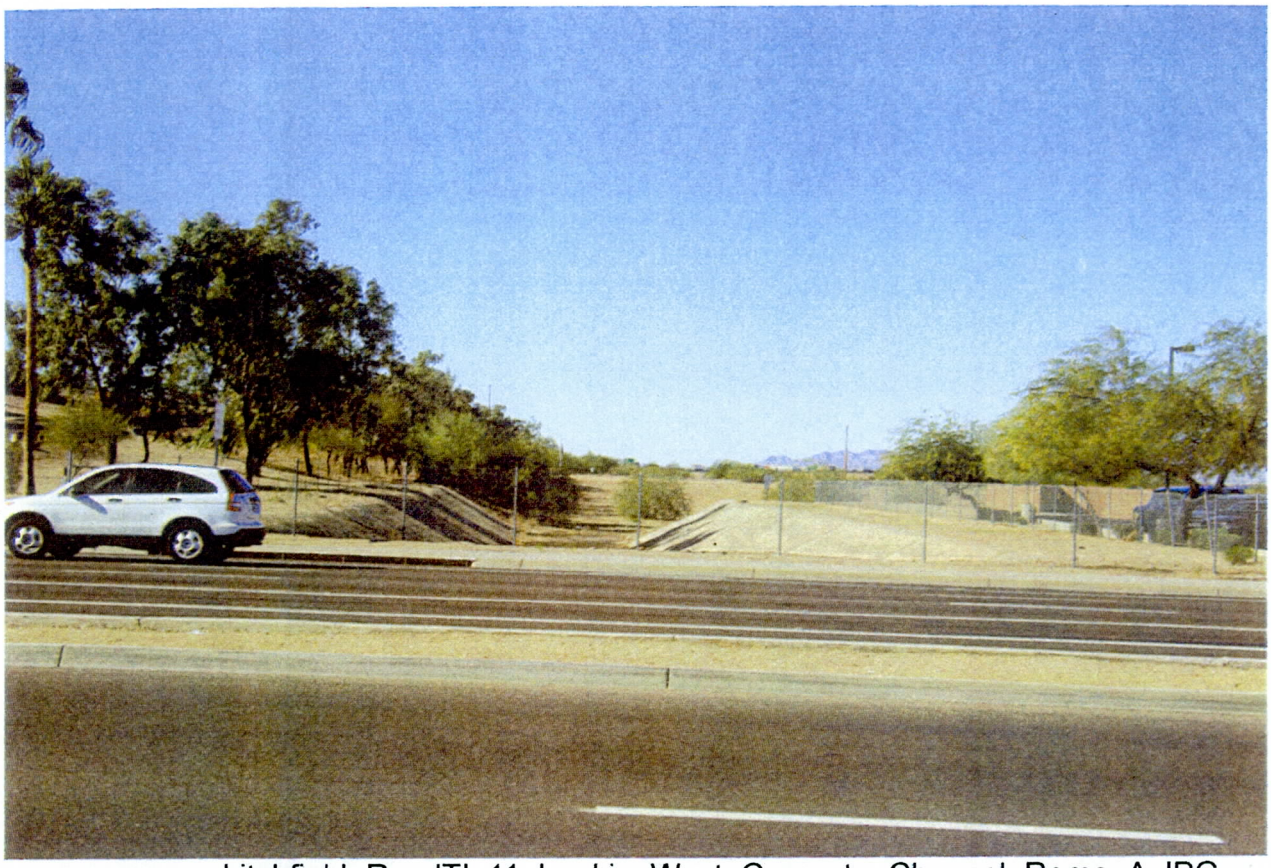


Litchfield_RoadTI_10_LookingWest_Concrete_Channel_Ramp_A.JPG

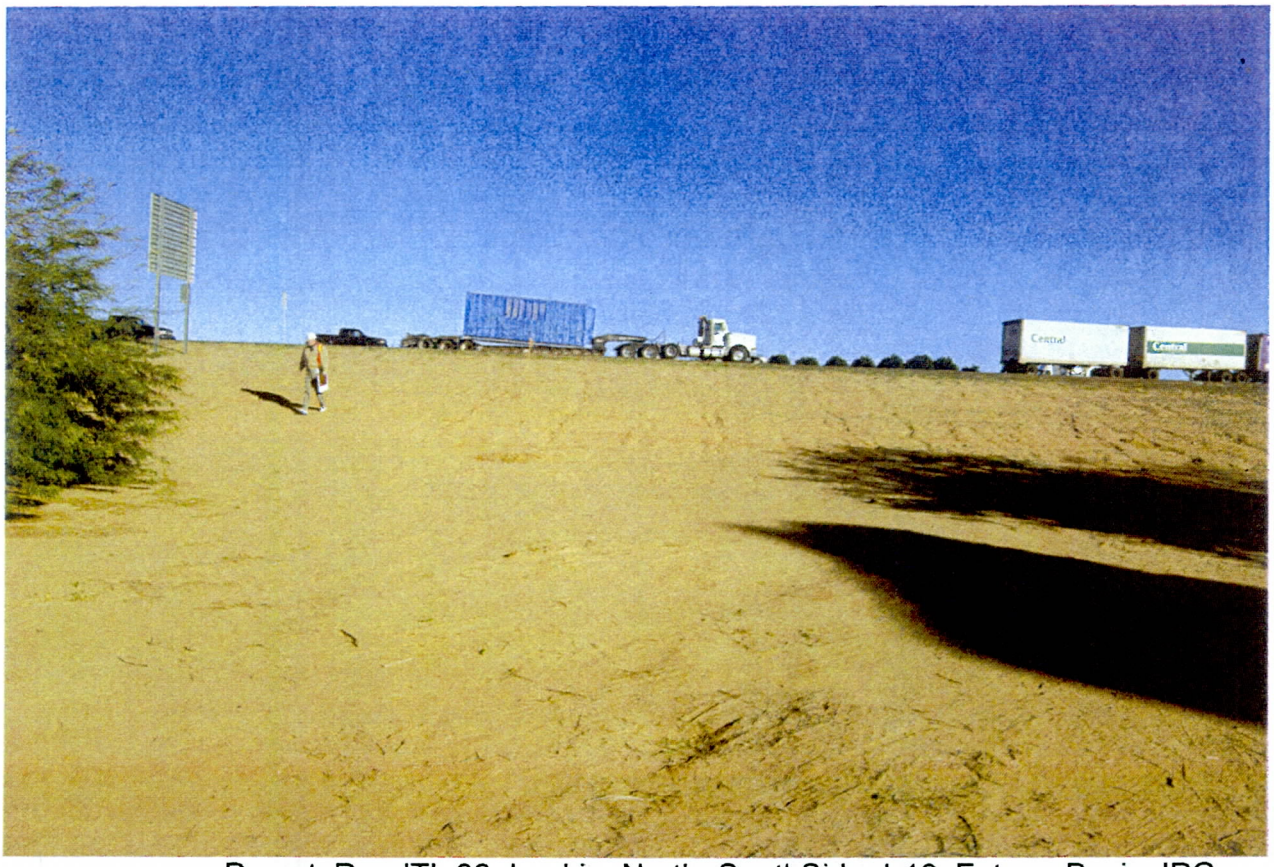


Litchfield_RoadTI_11_LookingWest_Concrete_Channel_Ramp_A.JPG

Litchfield_RoadTI_12_LookingWest_Concrete_Channel_Ramp_A.JPG

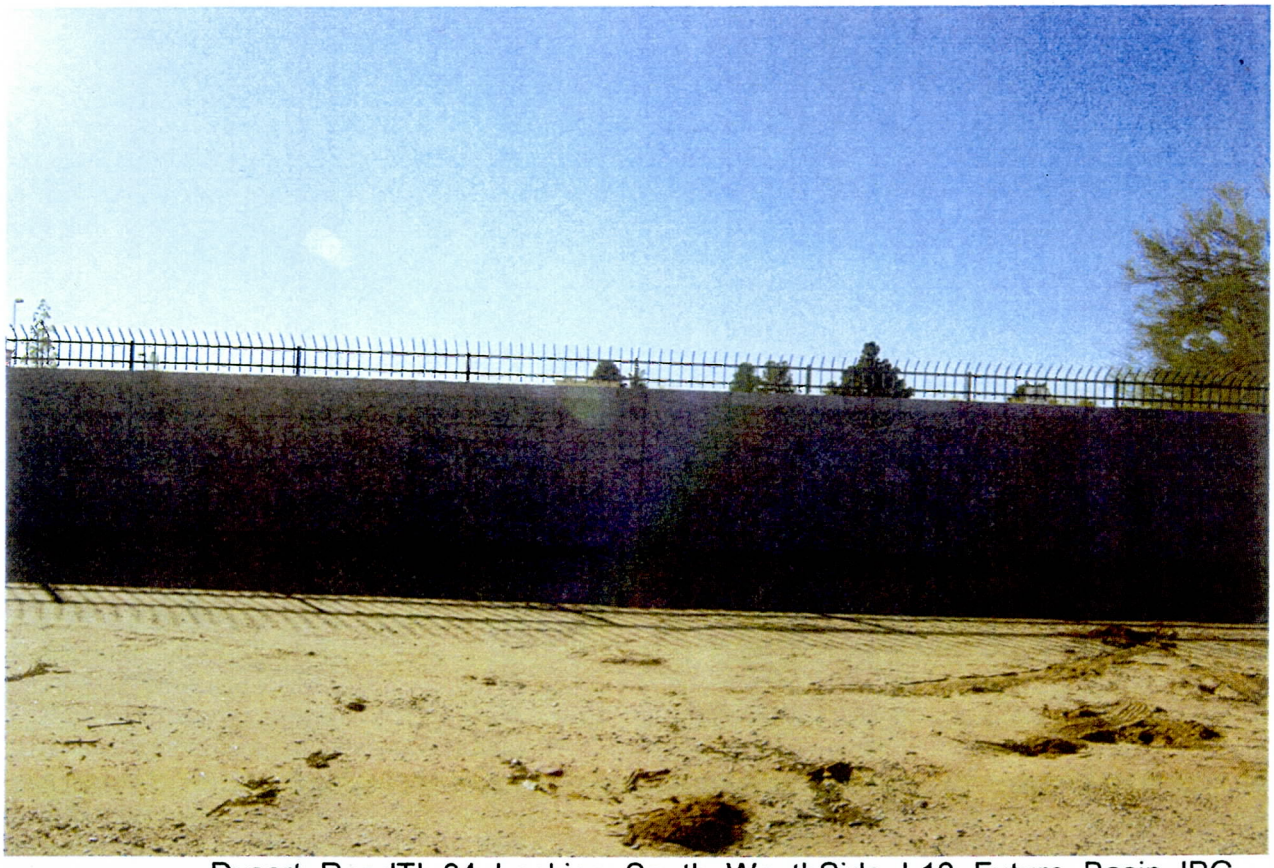
Litchfield_RoadTI_13_LookingEast_Ramp_C.JPG

Dysart_RoadTI_01_LookingWest_SouthSide_I-10_Future_Basin.JPG



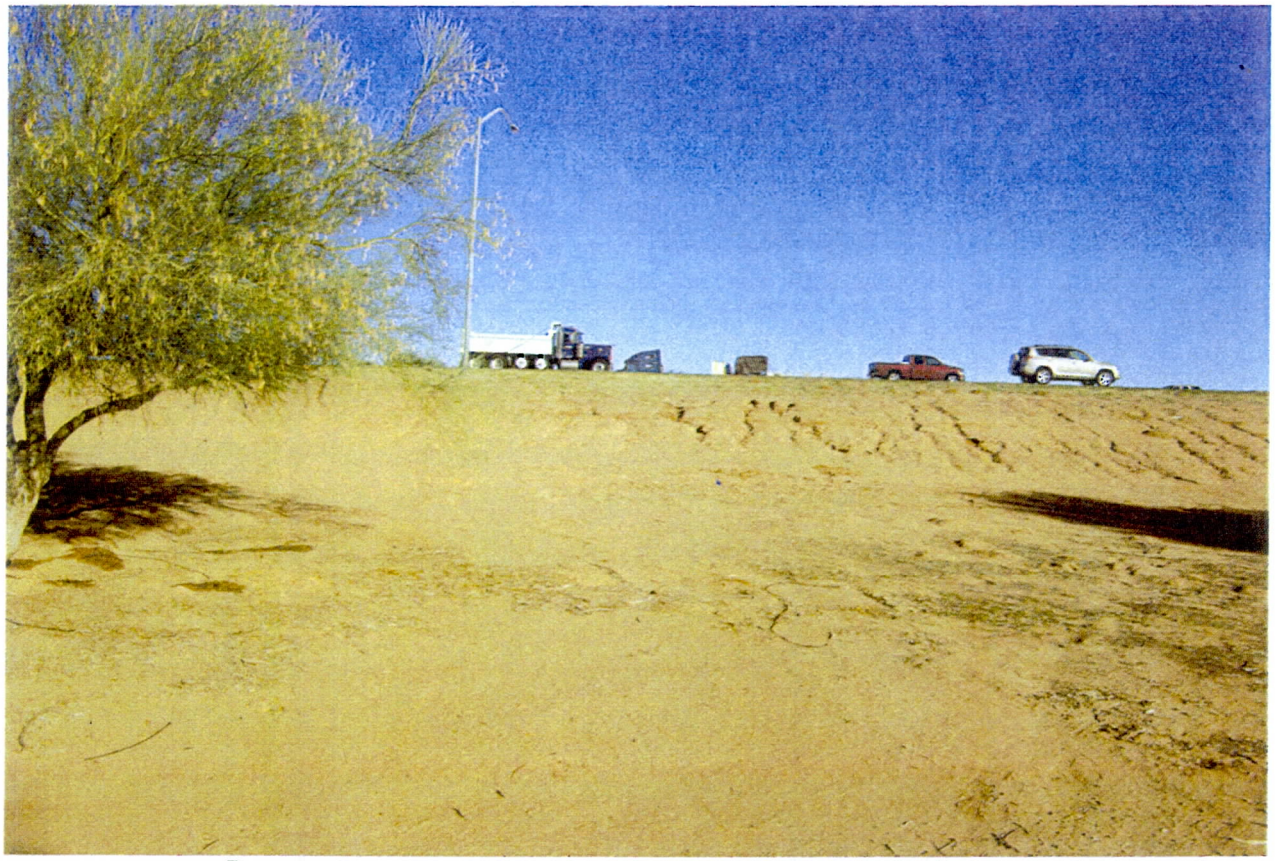
Dysart_RoadTI_02_LookingNorth_SouthSide_I-10_Future_Basin.JPG

Dysart_RoadTI_03LookingEast_SouthSide_I-10_Future_Basin.JPG



Dysart_RoadTI_04_Looking_South_WouthSide_I-10_Future_Basin.JPG

Dysart_RoadTI_05_LookingWest_SouthSide_I-10_Future_Basin.JPG



Dysart_RoadTI_06_LookingNorth_SouthSide_I-10_Future_Basin.JPG

Dysart_RoadTI_07_Looking_East_SouthSide_I-10_Future_Basin.JPG

Dysart_RoadTI_08LookingSouth_Southside_I-10_Future_Basin.JPG

Dysart_RoadTI_09_LookingWest_Station6815+00_SouthSide_I-10.JPG

Dysart_RoadTI_10_LookingNorth_Station6815+00_SouthSide_I-10.JPG

Dysart_RoadTI_11_LookingEast_Station6815+00_SouthSide_I-10.JPG

Dysart_RoadTI_12_LookingSouth_Station6815+00_SouthSide_I-10.JPG

Dysart_RoadTI_13_IrrigationofTrees_SouthSide_I-10_WestofDysartRd.JPG

Dysart_RoadTI_14_13_IrrigationofTrees_SouthSide_I-10_WestofDysartRd.JPG

Dysart_RoadTI_15_Ramp_B_LookingWest.JPG

Dysart_RoadTI_16_Ramp_B_LookingEast.JPG

Dysart_RoadTI_17_Ramp_B_LookingEast.JPG

Dysart_RoadTI_18_Ramp_D_LookingEast.JPG

Dysart_RoadTI_19_LookingEast_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_20_LookingSouth_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_21_LookingEast_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_22_LookingWest_Basin_NorthSide_I-10.JPG

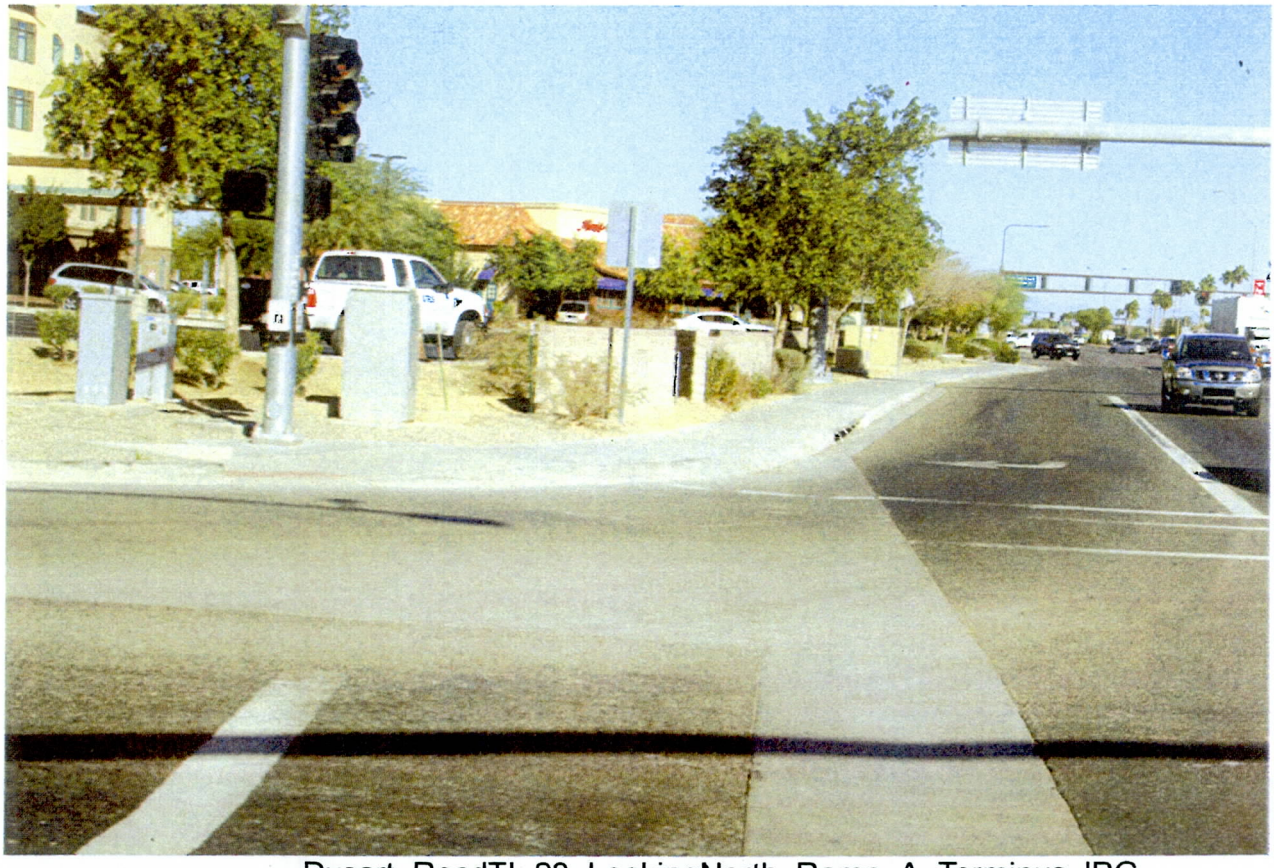
Dysart_RoadTI_23_LookingSouth_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_24_LookingSouth_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_25_LookingSouth_Basin_NorthSide_I-10.JPG

Dysart_RoadTI_26_lookingSouth_Ramp_A_Terminus.JPG

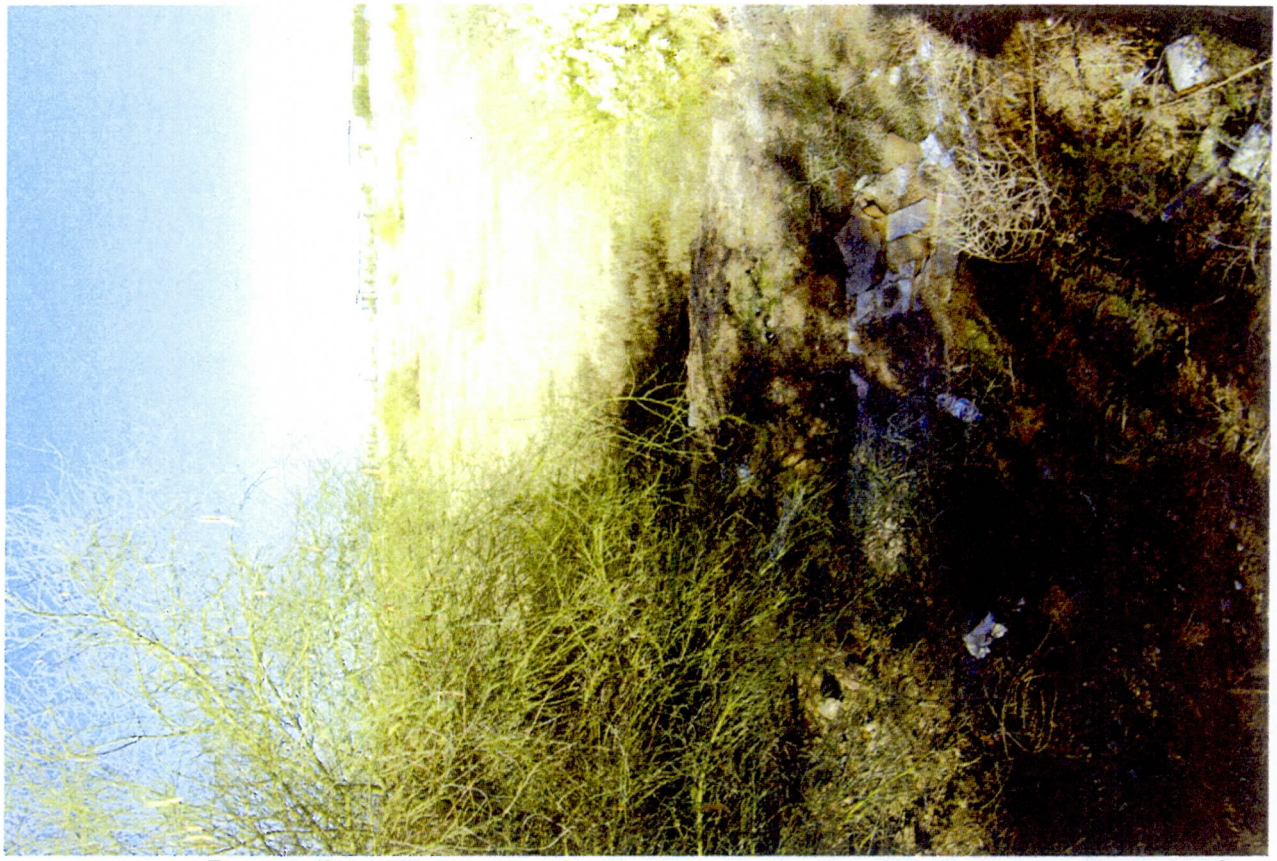
Dysart_RoadTI_27_LookingWest_Ramp_A.JPG



Dysart_RoadTI_28_LookingNorth_Ramp_A_Terminus.JPG

Dysart_RoadTI_29_LookingNorthwest_Ramp_A_Terminus.JPG

Dysart_RoadTI_30_LookingNorthwest_Ramp_A_Terminus.JPG

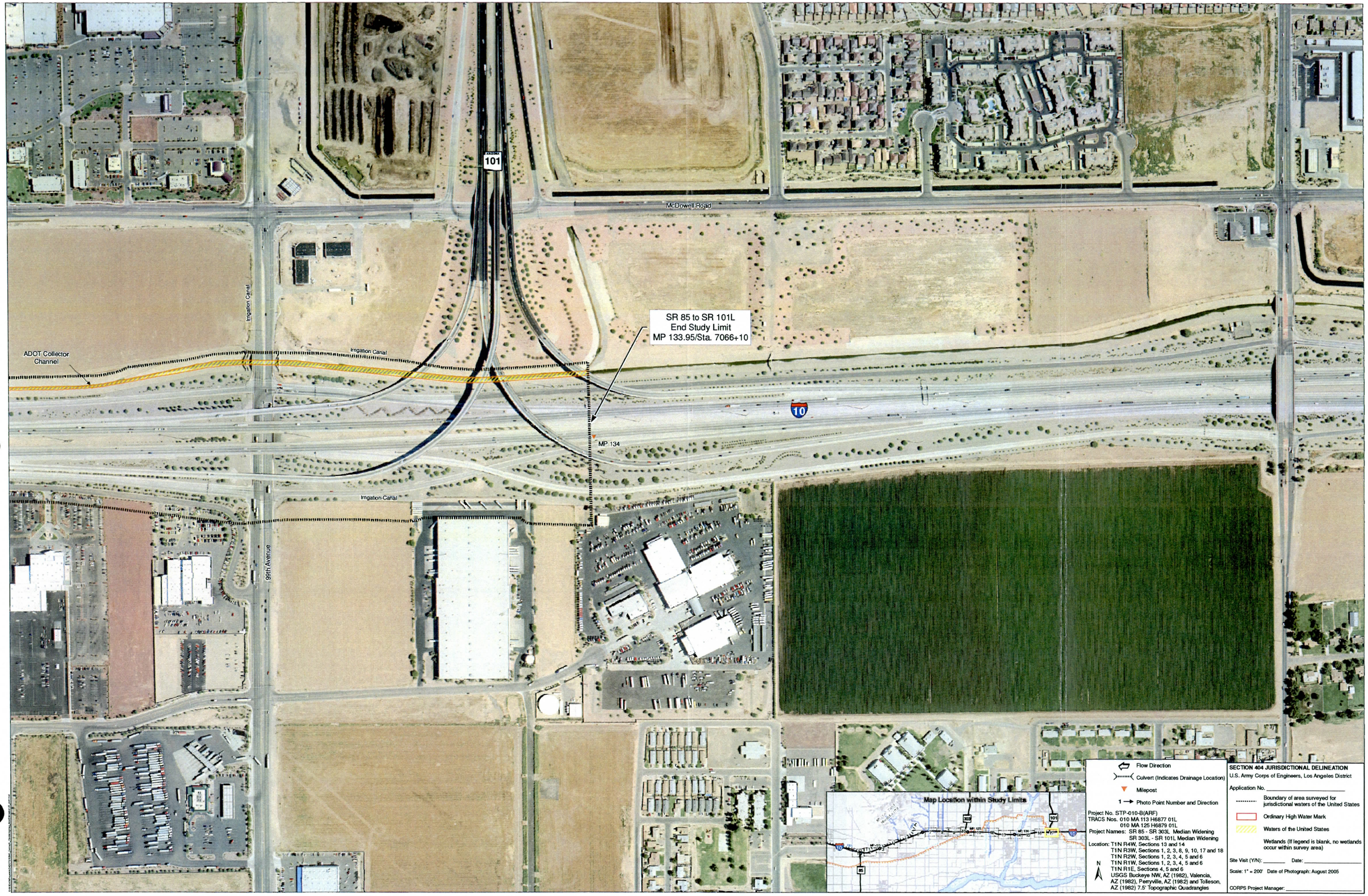


Dysart_RoadTI_31_LookingNorthwest_Dysart_SD_Outlet_to_Basin.JPG

Dysart_RoadTI_32_LookingSoutheast_at_Outlet_to_Basin.JPG

APPENDIX L

JURISDICTIONAL WATER OF THE UNITED STATES


ARIZONA
101
McDowell Road
Irrigation Canal
ADOT Collector Channel
Irrigation Canal
SR 85 to SR 101L
End Study Limit
MP 133.95/Sta. 7066+10
MP 134
10
Irrigation Canal
99th Avenue
Map Location within Study Limits
303
101
85
N
Flow Direction
Culvert (Indicates Drainage Location)
Milepost
1 Photo Point Number and Direction
Project No. STP-010-B(ARF)
TRACS Nos. 010 MA 113 H6877 01L
010 MA 125 H6879 01L
Project Names: SR 85 - SR 303L Median Widening
SR 303L - SR 101L Median Widening
Location: T1N R4W, Sections 13 and 14
T1N R3W, Sections 1, 2, 3, 8, 9, 10, 17 and 18
T1N R2W, Sections 1, 2, 3, 4, 5 and 6
T1N R1W, Sections 1, 2, 3, 4, 5 and 6
T1N R1E, Sections 4, 5 and 6
USGS Buckeye NW, AZ (1982), Valencia, AZ (1982), Perryville, AZ (1982) and Tolleson, AZ (1982) 7.5' Topographic Quadrangles
SECTION 404 JURISDICTIONAL DELINEATION
U.S. Army Corps of Engineers, Los Angeles District
Application No. _____
Boundary of area surveyed for jurisdictional waters of the United States
Ordinary High Water Mark
Waters of the United States
Wetlands (If legend is blank, no wetlands occur within survey area)
Site Visit (Y/N): _____ Date: _____
Scale: 1" = 200' Date of Photograph: August 2005
CORPS Project Manager: _____

McDowell Road

Irrigation Ditch

Irrigation Canal

Bullard Avenue

370

369

Bullard Wash 6708+00

MP 127

371

372

Irrigation Canal

Irrigation Canals

Irrigation Canal

Irrigation Canal

Irrigation Canal

Irrigation Canal

Irrigation Canal

Irrigation Canal

Irrigation Canal

MP 128

Irrigation Ditch

Flow Direction

Culvert (Indicates Drainage Location)

Milepost

1 → Photo Point Number and Direction

Project No. STP-010-B(ARF)
TRACS Nos. 010 MA 113 H6877 01L
010 MA 125 H6879 01L
Project Names: SR 85 - SR 303L Median Widening
SR 303L - SR 101L Median Widening
Location: T1N R4W, Sections 13 and 14
T1N R3W, Sections 1, 2, 3, 8, 9, 10, 17 and 18
T1N R2W, Sections 1, 2, 3, 4, 5 and 6
T1N R1W, Sections 1, 2, 3, 4, 5 and 6
T1N R1E, Sections 4, 5 and 6
USGS Buckeye NW, AZ (1982), Valencia, AZ (1982), Perryville, AZ (1982) and Tolleson, AZ (1982) 7.5' Topographic Quadrangles

Map Location within Study Limits

N

SECTION 404 JURISDICTIONAL DELINEATION

U.S. Army Corps of Engineers, Los Angeles District

Application No. _____

Boundary of area surveyed for jurisdictional waters of the United States

Ordinary High Water Mark

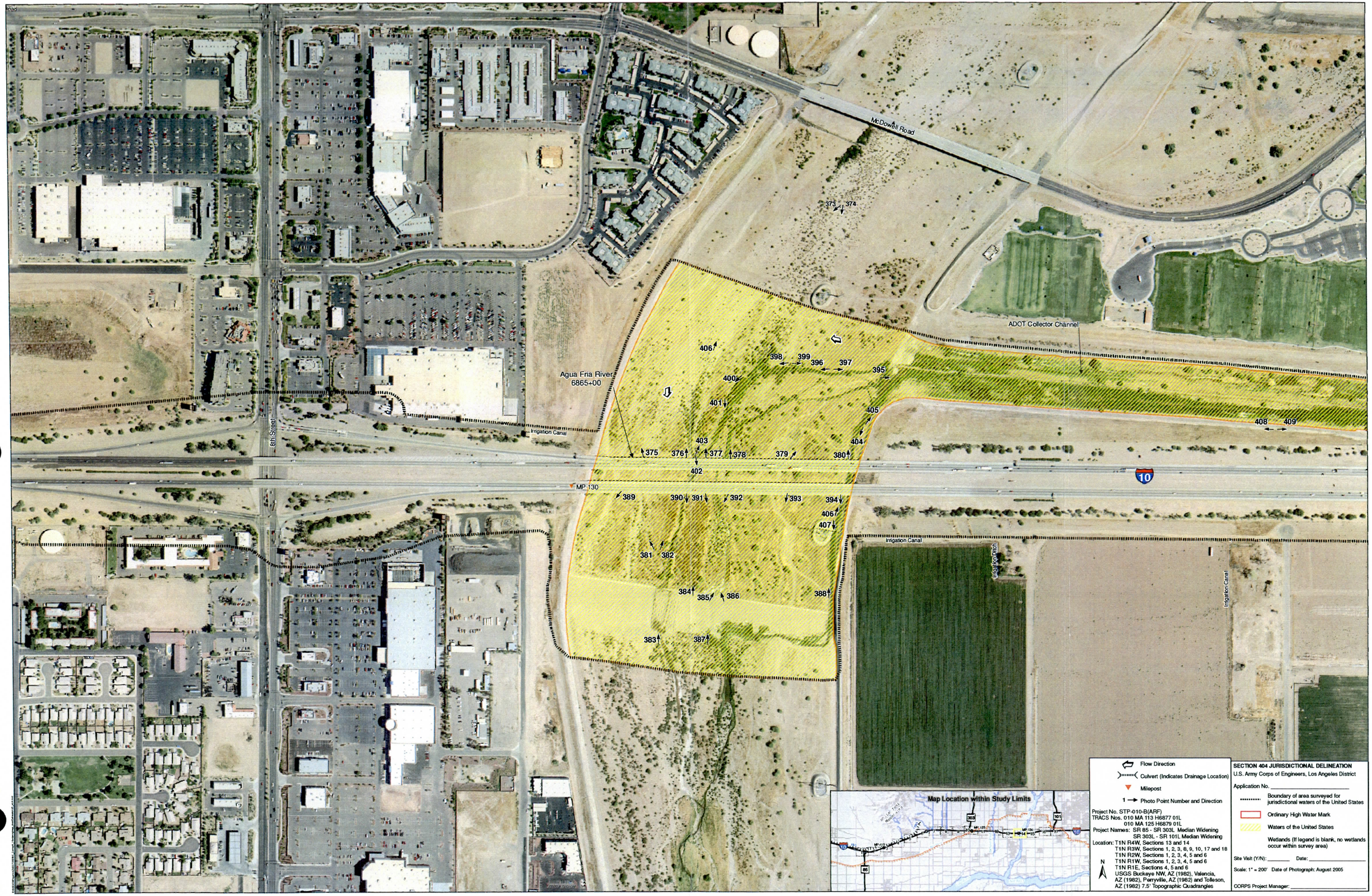
Waters of the United States

Wetlands (If legend is blank, no wetlands occur within survey area)

Site Visit (Y/N): _____ Date: _____

Scale: 1" = 200' Date of Photograph: August 2005

CORPS Project Manager: _____


McDowell Road
ADOT Collector Channel
Agua Fria River
6865+00
8th Street
Irrigation Canal
MP 130
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
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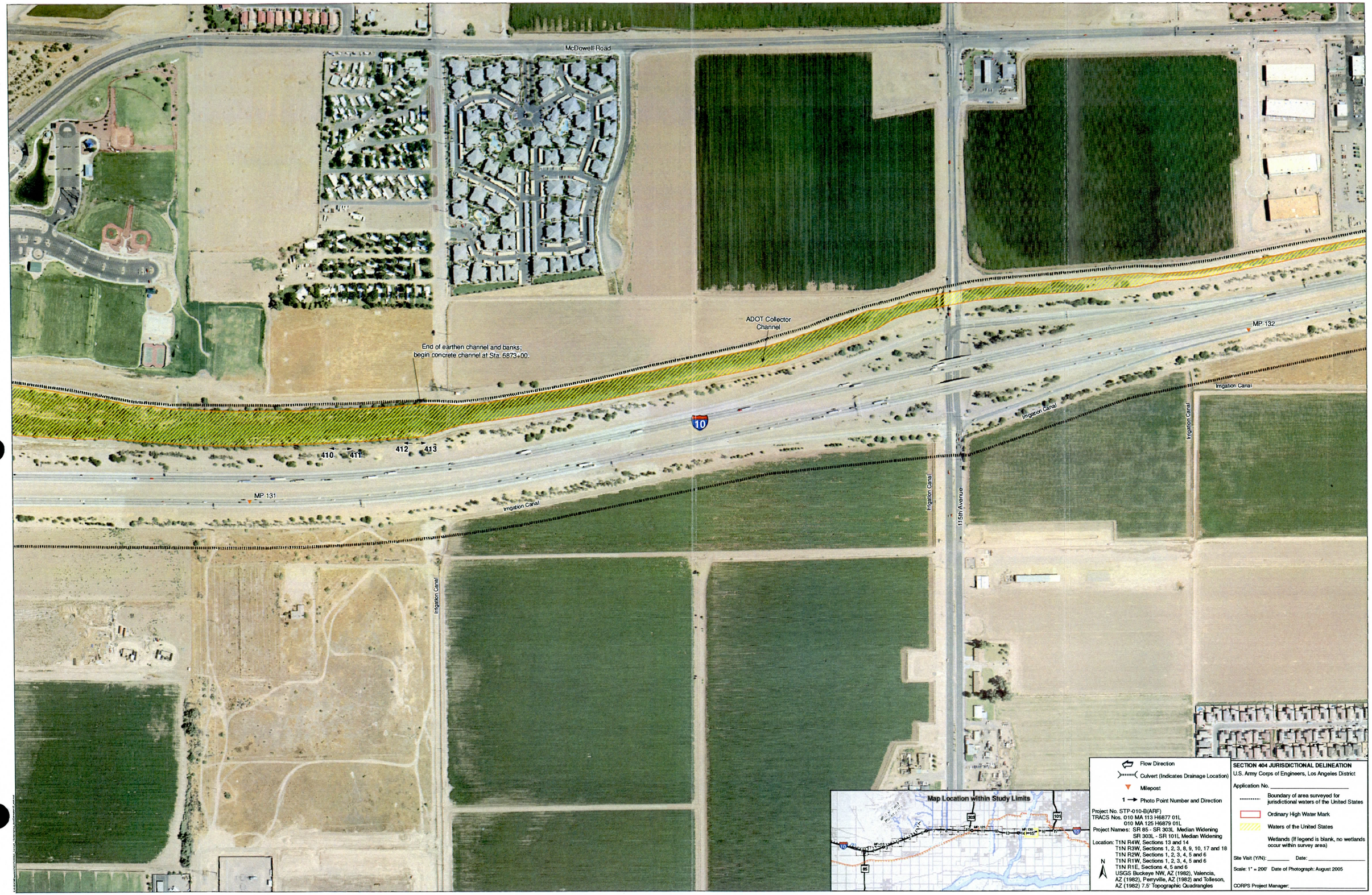
401
402
403
404
405
406
407
408
409
10
Irrigation Canal
Irrigation Ditch
Irrigation Canal
Map Location within Study Limits
N
Flow Direction
Culvert (Indicates Drainage Location)
Milepost
1 → Photo Point Number and Direction
Project No. STP-010-B(ARF)
TRACS Nos. 010 MA 113 H6877 01L
010 MA 125 H6879 01L
Project Names: SR 85 - SR 303L Median Widening
SR 303L - SR 101L Median Widening
Location: T1N R4W, Sections 13 and 14
T1N R3W, Sections 1, 2, 3, 8, 9, 10, 17 and 18
T1N R2W, Sections 1, 2, 3, 4, 5 and 6
T1N R1W, Sections 1, 2, 3, 4, 5 and 6
T1N R1E, Sections 4, 5 and 6
USGS Buckeye NW, AZ (1982), Valencia, AZ (1982), Perryville, AZ (1982) and Tolleson, AZ (1982) 7.5' Topographic Quadrangles
SECTION 404 JURISDICTIONAL DELINEATION
U.S. Army Corps of Engineers, Los Angeles District
Application No. _____
Boundary of area surveyed for jurisdictional waters of the United States
Ordinary High Water Mark
Waters of the United States
Wetlands (If legend is blank, no wetlands occur within survey area)
Site Visit (Y/N): _____ Date: _____
Scale: 1" = 200' Date of Photograph: August 2005
CORPS Project Manager: _____



Project No. STP-010-B(ARF)
TRACS Nos. 010 MA 113 H6877 01L
010 MA 125 H6879 01L
Project Names: SR 85 - SR 303L Median Widening
SR 303L - SR 101L Median Widening
Location: T1N R4W, Sections 13 and 14
T1N R3W, Sections 1, 2, 3, 8, 9, 10, 17 and 18
T1N R2W, Sections 1, 2, 3, 4, 5 and 6
T1N R1W, Sections 1, 2, 3, 4, 5 and 6
T1N R1E, Sections 4, 5 and 6
USGS Buckeye NW, AZ (1982), Valencia, AZ (1982), Perryville, AZ (1982) and Tolleson, AZ (1982) 7.5' Topographic Quadrangles

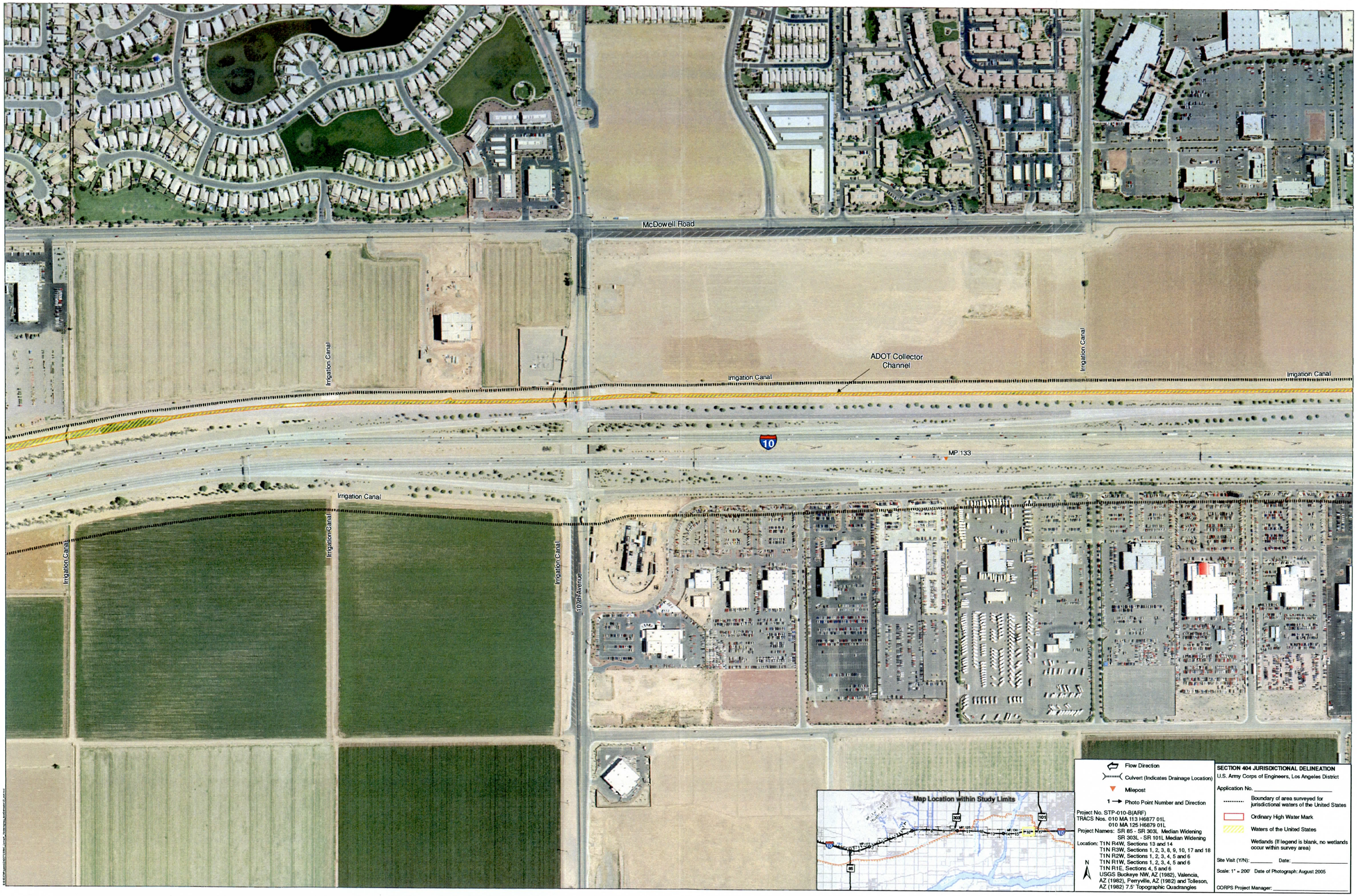
SECTION 404 JURISDICTIONAL DELINEATION
U.S. Army Corps of Engineers, Los Angeles District

Application No. _____

Site Visit (Y/N): _____ Date: _____

Scale: 1" = 200' Date of Photograph: August 2005

CORPS Project Manager: _____


McDowell Road
Irrigation Canal
Irrigation Canal
ADOT Collector Channel
Irrigation Canal
Irrigation Canal
10
MP 133
Irrigation Canal
Irrigation Canal
Irrigation Canal
107th Avenue
Map Location within Study Limits
Flow Direction
Culvert (Indicates Drainage Location)
Milepost
1 Photo Point Number and Direction
Project No. STP-010-B(ARF)
TRACS Nos. 010 MA 113 H6877 01L
010 MA 125 H6878 01L
Project Names: SR 85 - SR 303L Median Widening
SR 303L - SR 101L Median Widening
Location: T1N R4W, Sections 13 and 14
T1N R3W, Sections 1, 2, 3, 8, 9, 10, 17 and 18
T1N R2W, Sections 1, 2, 3, 4, 5 and 6
T1N R1W, Sections 1, 2, 3, 4, 5 and 6
T1N R1E, Sections 4, 5 and 6
USGS Buckeye NW, AZ (1982), Valencia, AZ (1982), Perryville, AZ (1982) and Tolleson, AZ (1982) 7.5' Topographic Quadrangles
N
SECTION 404 JURISDICTIONAL DELINEATION
U.S. Army Corps of Engineers, Los Angeles District
Application No. _____
Boundary of area surveyed for jurisdictional waters of the United States
Ordinary High Water Mark
Waters of the United States
Wetlands (If legend is blank, no wetlands occur within survey area)
Site Visit (Y/N): _____ Date: _____
Scale: 1" = 200' Date of Photograph: August 2005
CORPS Project Manager: _____

APPENDIX M

FLOOD PLAIN MAPS

Federal Emergency Management Agency

Washington, D.C. 20472

OCT 17 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable James M. Cavanaugh
Mayor, City of Goodyear
190 North Litchfield Road
Goodyear, AZ 85338

IN REPLY REFER TO:
Case No.: 06-09-B034P
Community Name: City of Goodyear, AZ
Community No.: 040046
Effective Date of This Revision: OCT 17 2006

Dear Mayor Cavanaugh:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Kevin C Long

Kevin C. Long, Project Engineer
Engineering Management Section
Mitigation Division

For: William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

List of Enclosures:
Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map
Annotated Flood Insurance Study Report

cc: The Honorable Max Wilson
Chairman, Maricopa County
Board of Supervisors

Mr. David Ramirez, P.E.
City Engineer
City of Goodyear

Mr. Ted Collins, CFM
Principal Floodplain Administrator
Flood Control District of Maricopa County

Mr. Tim S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. Tim Murphy, P.E., CFM
Flood Delineation Branch Manager
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

Mr. Shimin Zou, Ph.D., P.E.
Project Manager
Wood, Patel & Associates, Inc.

Mr. Ashok C. Patel, P.E., R.L.S., CFM
Principal
Wood, Patel & Associates, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City Of Goodyear Maricopa County Arizona	NO PROJECT	FLOODWAY HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040046		
IDENTIFIER	Goodyear Centerpointe	APPROXIMATE LATITUDE & LONGITUDE: 33.460, -112.340 SOURCE: Precision Mapping Streets DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 04013C2060 G DATE: September 30, 2005	DATE OF FLOOD INSURANCE STUDY REPORT: September 30, 2005 PROFILES: 628P, 629(a)P FLOODWAY DATA TABLE: 5 SUMMARY OF DISCHARGES TABLE: 3

nclosures reflect changes to flooding sources affected by this revision.
FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Bullard Wash - from approximately 3,000 miles downstream to approximately 2,000 feet upstream of I-10
Unnamed Flooding Source West of Bullard Wash – from the confluence to approximately 4,000 feet west of the confluence with Bullard Wash

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Bullard Wash	Zone AE	Zone AE	NONE	YES
	Floodway	Floodway	NONE	NONE
	BFEs*	BFEs*	NONE	NONE
Unnamed Flooding Source	Zone AE	Zone X (unshaded)	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

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Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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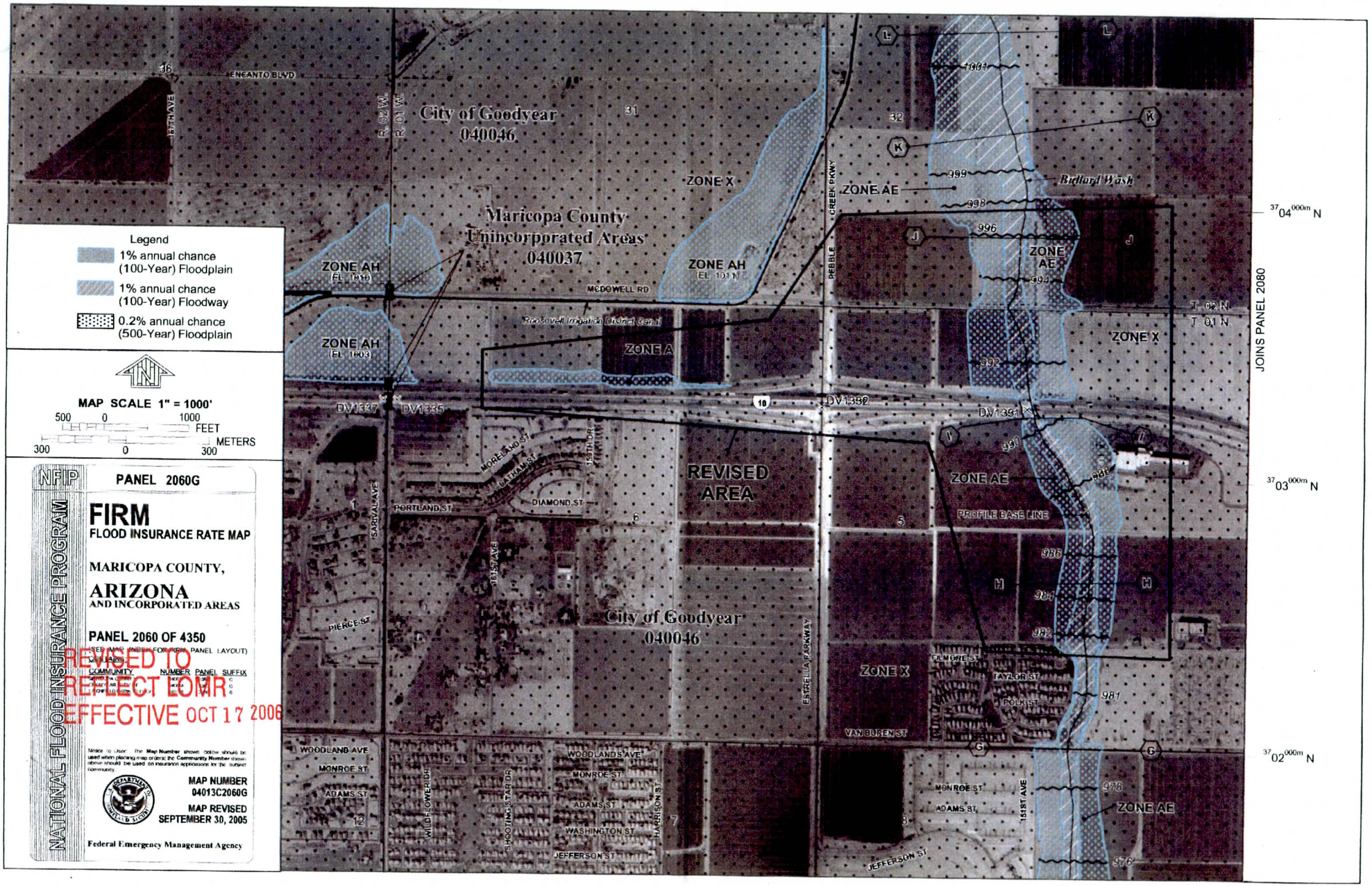
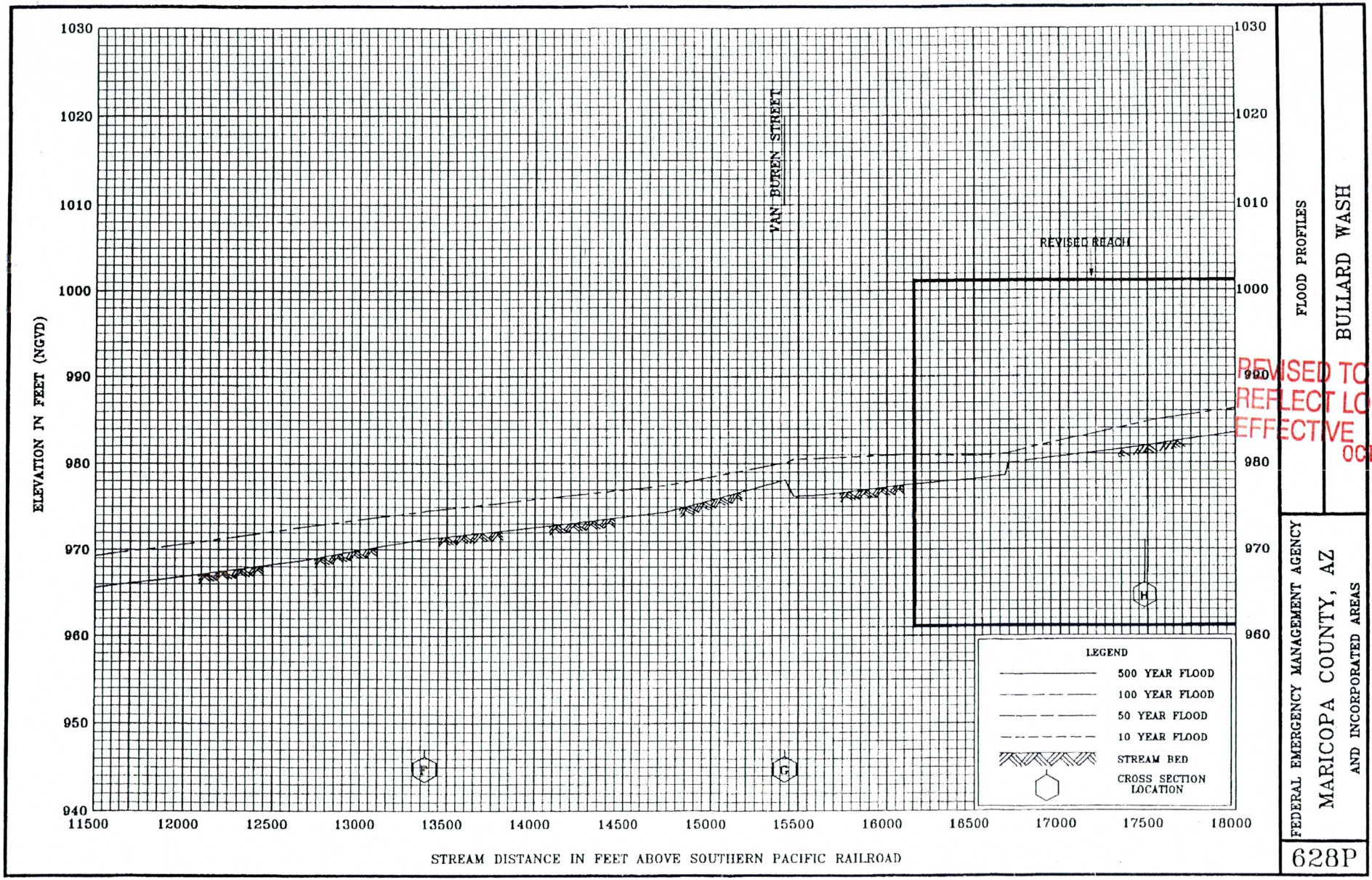

Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
MAP SCALE 1" = 1000'
500 0 1000 FEET
300 0 300 METERS
NFIP
PANEL 2060G
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 2060 OF 4350
COMMUNITY NUMBER PANEL SUFFIX
MAP NUMBER 04013C2060G
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
REVISED TO REFLECT LOMR
EFFECTIVE OCT 17 2006
City of Goodyear 040046
Maricopa County Unincorporated Areas 040037
ZONE AH (EL 1010)
ZONE AH (EL 1011)
ZONE AH (EL 1003)
ZONE A
ZONE X
ZONE AE
REVISED AREA
PROFILE BASE LINE
Roosevelt Irrigation District Canal
Bullard Wash
ENCANTO BLVD
MCDOWELL RD
PORTLAND ST
DIAMOND ST
MORELAND ST
DURHAM ST
PIERCE ST
WOODLAND AVE
MONROE ST
ADAMS ST
WASHINGTON ST
JEFFERSON ST
VAN BUREN ST
TAYLOR ST
FOLK ST
FILMORE ST
PEBBLE CREEK PKWY
ESTRELLA PARKWAY
157TH AVE
151ST AVE
WILDFLOWER DR
SHOOTING STAR DR
HARRISON ST
DV1337
DV1335
DV1352
DV1351
R.02 W.
R.01 W.
T.02 N.
T.01 N.
JOINS PANEL 2080
37 04 000m N
37 03 000m N
37 02 000m N



FLOOD PROFILES

BULLARD WASH

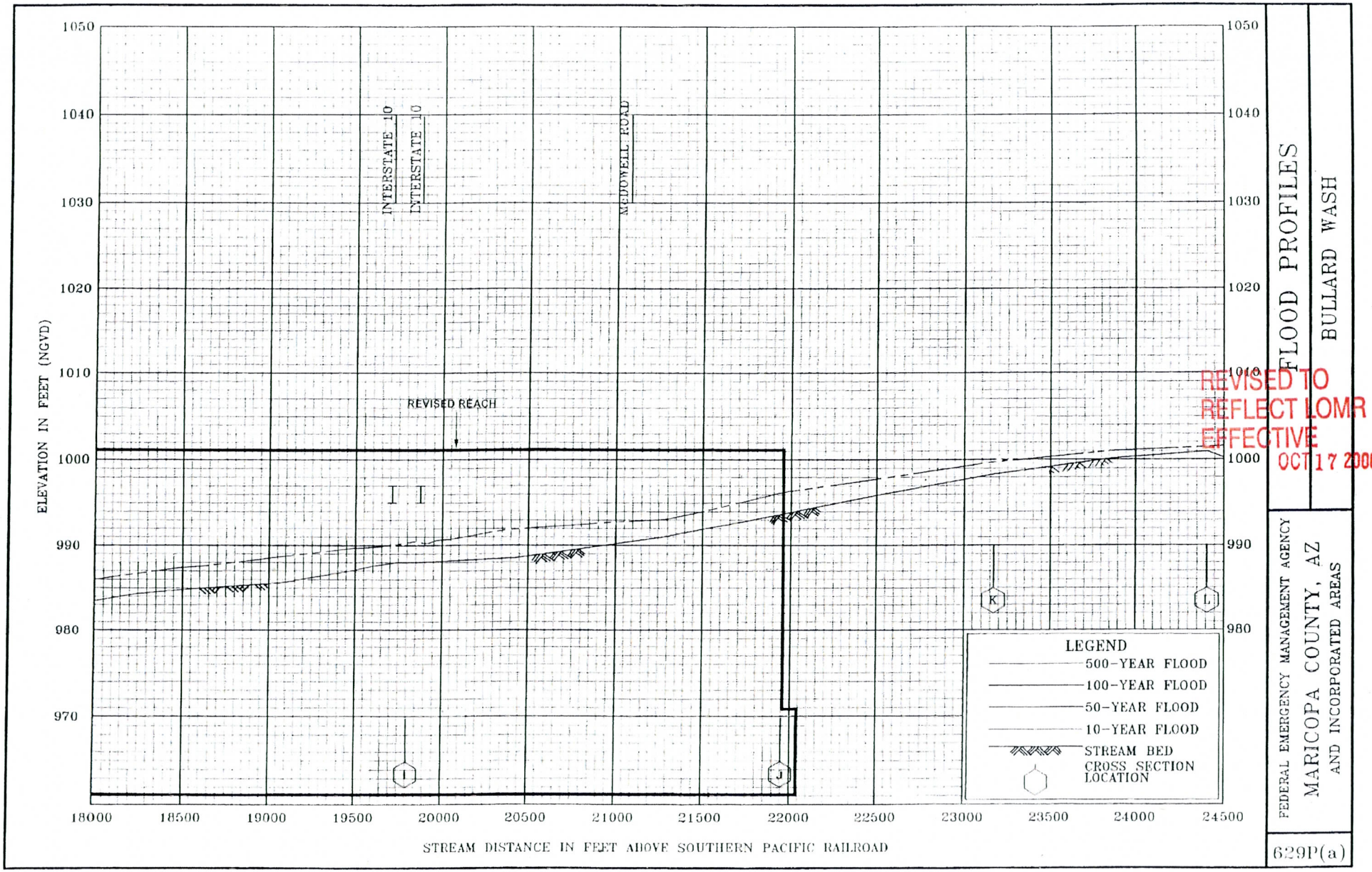
REVISED TO REFLECT LOMR EFFECTIVE OCT 17 2006

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

628P



FLOOD PROFILES

BULLARD WASH

REVISED TO REFLECT LOMR EFFECTIVE OCT 17 2006

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

629P(a)

REVISED TO
REFLECT LOMR
EFFECTIVE OCT 17 2006

Table 3. Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
White Granite Wash					
At the retention basin on Caterpillar Proving Grounds	3.46	--[1]	--[1]	1,933	--[1]
At 0.8 miles upstream of the confluence with White Granite Wash North Fork (interpolated discharge from White Tanks/Agua Fria ADMS HEC-1 run)	0.39	--[1]	--[1]	344	--[1]
White Granite Wash North Fork					
At 0.1 miles upstream of the confluence with White Granite Wash	1.60	--[1]	--[1]	1,353	--[1]
191st Avenue Wash (Peak discharges have been derived by performing a HEC-2 split flow analysis along 191st Avenue Wash)					
200 feet north of Interstate 10	--[1]	--[1]	--[1]	617	--[1]
At Indian School Road	--[1]	--[1]	--[1]	147	--[1]
At Camelback Road	--[1]	--[1]	--[1]	564	--[1]
Perryville Road Wash					
At Camelback Road	13.17	--[1]	--[1]	470	--[1]
At the intersection of Camelback Road and Perryville Road	13.04	--[1]	--[1]	1,190	--[1]
At Glendale Avenue	11.58	--[1]	--[1]	1,450	--[1]
Bullard Wash					
At Lower Buckeye Road	91.66	--[1]	--[1]	4,906	--[1]
At Yuma Road	89.93	--[1]	--[1]	4,438	--[1]
Downstream of Interstate 10	88.27	--[1]	--[1]	2,249	--[1]
Upstream of Interstate 10	88.27	--[1]	--[1]	2,521	--[1]

Revised Data

--[1] Not Computed

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bullard Wash		REVISED DATA						
A[2]								
B	5,200	415	1,378	2.3	947.9	947.9	948.7	0.8
C	7,213	287	812	3.9	955.6	955.6	956.4	0.8
D	9,433	323	1,090	2.5	962.6	962.6	963.6	1.0
E	11,283	481	857	3.2	968.7	968.7	969.7	1.0
F	13,373	206	754	3.6	974.5	974.5	975.5	1.0
G	15,423	260	637	4.3	980.1	980.1	980.6	0.5
H	17,492	230	732	3.5	985.0	985.0	985.7	0.7
I	19,800	175	473	4.8	990.3	990.3	990.8	0.5
J	21,952	287	828	3.5	996.0	996.0	996.6	0.6
K	23,182	1,213	1,425	1.4	999.6	999.6	1,000.1	0.5
L	24,417	811	705	0.5	1,001.4	1,001.4	1,001.4	0.0
M	26,906	148	768	5.3	1,014.2	1,014.2	1,014.2	0.0
N	27,478	161	719	5.7	1,015.0	1,015.0	1,015.0	0.0
O	28,358	173	680	6.0	1,015.8	1,015.8	1,015.8	0.0
P	28,837	161	771	5.3	1,017.2	1,017.2	1,017.2	0.0
Q	29,857	234	910	4.5	1,018.7	1,018.7	1,018.7	0.0
R	30,862	267	1,031	4.0	1,019.8	1,019.8	1,019.8	0.0
S	31,682	169	858	4.8	1,022.1	1,022.1	1,022.1	0.0
T	31,944	464	621	6.6	1,023.7	1,023.7	1,023.7	0.0
U	39,520	515	991	4.3	1,050.2	1,050.2	1,050.4	0.2
V	41,400	815	1,170	3.2	1,058.8	1,058.8	1,059.1	0.3
W	43,260	310	665	1.1	1,060.6	1,060.6	1,061.0	0.4
X	44,840	85	224	3.4	1,062.9	1,062.9	1,062.9	0.0

REVISED TO REFLECT LOMR EFFECTIVE OCT 17 2006

[1]Feet Above Southern Pacific Railroad [2]Cross Section Not Used

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

BULLARD WASH

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the *National Geodetic Vertical Datum of 1929*. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

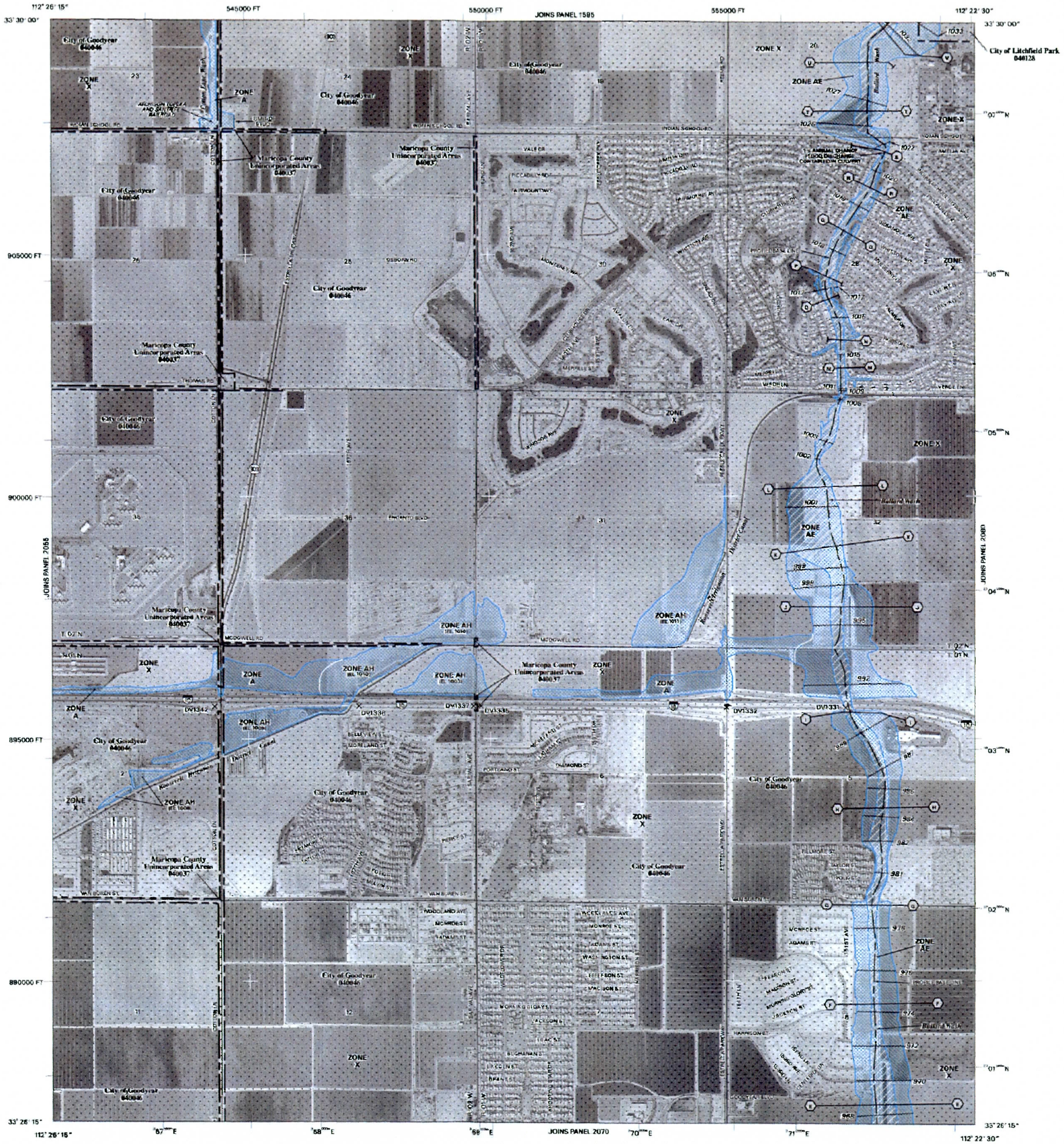
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)—(A)	Cross section line
(2)—(2)	Transect line
112° 07' 08", 33° 25' 41"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
76 E	1000-meter Universal Transverse Mercator grid ticks, zone 12
875000 FT	5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 3176), NAD83 (Transverse Mercator)
x DV2312	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2060G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 2060 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GOODYEAR, CITY OF	040046	2060	G
LITCHFIELD PARK, CITY OF	040128	2060	G
MARICOPA COUNTY	040037	2060	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C2060G

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

NOTES TO USERS

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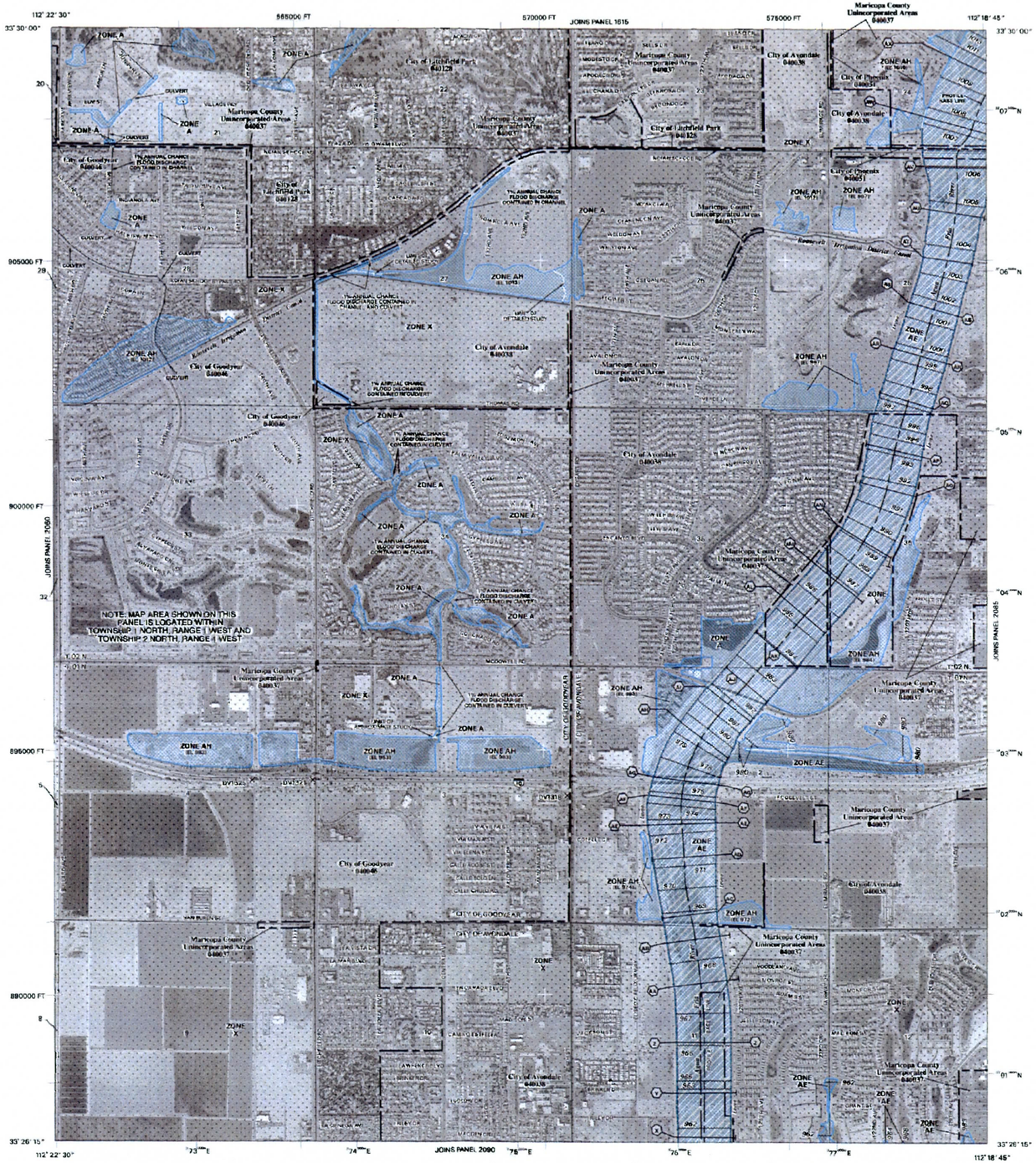

LEGEND

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- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
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The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet *
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet *

* Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross section line
- 23 — 23 — Transect line

112° 07' 08", 33° 25' 41" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

1000-meter Universal Transverse Mercator grid ticks, zone 12

875000 FT — 5000-foot ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 3176), NAD83 (Transverse Mercator)

X TM2513 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M5.5 — River Mile

MAP REPOSITORY
Refer to Repositories listed in Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1998

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 30, 2005; September 4, 1991; September 30, 1985; July 16, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change zone designations, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2080J

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 2080 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2080	J
GOODYEAR, CITY OF	040046	2080	J
LITCHFIELD PARK, CITY OF	040129	2080	J
MARICOPA COUNTY	040037	2080	J
PHOENIX, CITY OF	040051	2080	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C2080J
MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data tables, Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFE's shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD'29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross-sections and interpolated between cross-sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Arizona State Plane (zone 3176) (Lambert Conformal Conic). The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophotos images were produced at a scale of 1:12000 using NAD'83 for control. Aerial photography is dated December 2000 to December 2002.

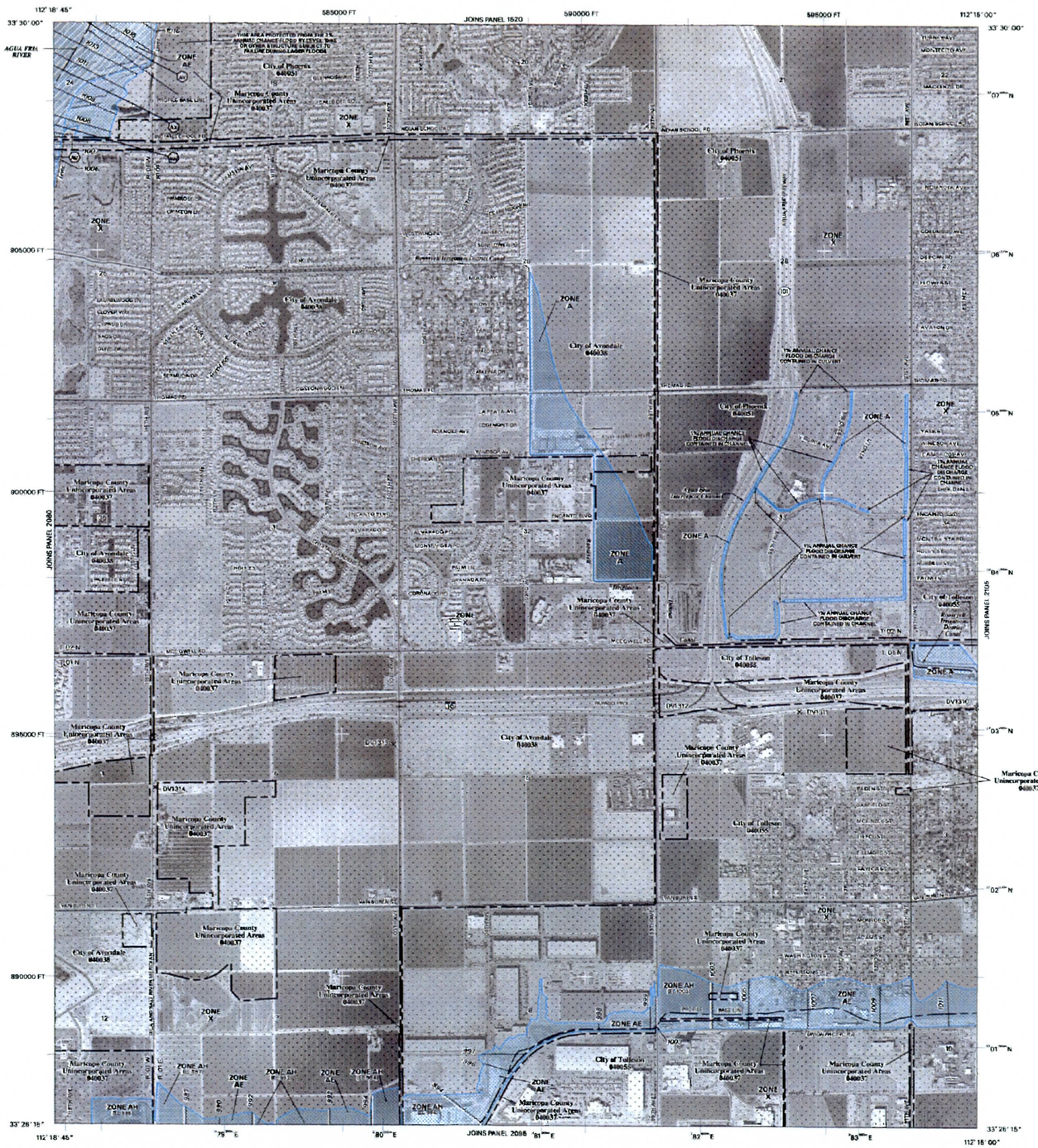
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flooding by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- (A) — (A) — Cross section line
- (23) — (23) — Transect line

112° 07' 08", 33° 25' 41" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

1000-meter Universal Transverse Mercator grid ticks, zone 12

5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 3176), NAD83, Transverse Mercator

DV2313 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M5.5 — River Mile

MAP REPOSITORY
Refer to Repositories Listing on Map Index

EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991; July 15, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to reflect updated topographic information, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2085G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 2085 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2085	G
MARICOPA COUNTY*	040037	2085	G
PHOENIX, CITY OF	040051	2085	G
TOLLESON, CITY OF	040055	2085	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C2085G
MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

APPENDIX N

PROJECT RELATED MEMOS

From:	Wendy Terlizzi
To:	Bill_Dehn@URSCorp.com
cc:	Stephanie Huang; Dave_Schaub@URSCorp.com
Subject:	RE: I-10 Widening over Agua Fria River
Date:	02/19/2008 12:35 PM

This week is extremely busy and unfortunately I do not have any spare time. Next week I am pretty wide open if you would still like to get together (Tuesday is the only day that would not work).

At this time there are no required treatment measures for our projects. That requirement will not go into effect until we have a finalized and signed permit. At the effective date of this signed permit, those projects that have moved beyond Stage I of development (15%) do not need to consider and redesign in post-construction BMPs.

Thank you,
Wendy

Wendy Terlizzi
ADOT Office of Environmental Services
Water Quality Manager
602-712-8353

From: Bill_Dehn@URSCorp.com [mailto:Bill_Dehn@URSCorp.com]
Sent: Monday, February 18, 2008 1:55 PM
To: Wendy Terlizzi
Cc: Stephanie Huang; Dave_Schaub@URSCorp.com
Subject: I-10 Widening over Agua Fria River

Wendy - We have seen that the Preliminary Draft BMP Manual has been published. We would like to meet with you and discuss the widening of the I-10 bridge over the Agua Fria and any required treatment measures. Do you have some time later this week (Wed-Fri)? Let us know what your schedule looks like. Thanks, BD

Bill Dehn, PE
URS Phoenix Office
7720 North 16th Street, Suite 100
Phoenix, AZ 85020
Office General Number: 602.371.1100
Direct Line: 602.648.2442
Cell Number: 480.208.8526

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January 16, 2008

MEETING SUMMARY

Final Design for I-10 Outside Widening, Sarival-Dysart
TRACS No. 010 MA 125 H7296 01 C
January 16, 2008
9:00 AM MST – Drainage Issues Meeting

ATTENDEES:

ADOT

Stephanie Huang – Valley Proj. Mgmt
Ken Akoh-Arrey – Drainage Design
Syad Alam – Drainage Design

Others

SUBCONSULTANTS

URS

Bill Dehn Dave Schaub Josiah Roberts Dennis Jermeland

The meeting followed a prepared agenda that was provided to all attendees (Copy Attached). The following items were discussed:

I. Welcome and Introductions

Stephanie Huang opened the meeting with a welcome and team introductions.

II. I-10 Widening Design Schedule - Status

The Stage III Submittal date is 29 February 2008.

III. Overall Drainage Design

Dave Schaub presented an overview of the project, which consisted of the following:

1. This outside widening project is to widen the pavement to the outside. (A construction project to widen this segment of I-10 into the median will begin shortly.) The ramps will be constructed to a permanent condition with curb & gutter or half barrier to accommodate additional future widening along the mainline I-10 roadway. Between the TIs, the mainline embankment will be constructed to its ultimate location to accommodate future widening. The present project will construct some of the mainline widening without curb & gutter or half barrier. Curb & gutter or half barrier will be constructed with the future widening.
2. The three cross drainage facilities along this project are:
    a. Five-29"x45" HERCP culverts, Station 6553+00 located proximate to the west end of the project. Flow is north to south.

b. Bullard Wash Bridge, Station 6734+85.07 to 6736+26.25 located between Estrella Parkway and Bullard Avenue. Flow is north to south.

c. Agua Fria River Bridge, Station 6857+48.19 to 6872+50.31 located at the east end of the project. Flow is north to south.

3. Additional offsite drainage facilities are the Existing FCDMC Regional Detention Basins located along the north side of I-10 between the Bullard Avenue TI and the Dysart Road TI. There are four distinct basins divided by the north-south facilities of the Union Pacific Pacific Railroad, Litchfield Road, and an Irrigation crossing at Station 6815+15±.

4. Onsite I-10 pavement drainage sheet flows both north and south down the roadway slopes. Along the north side of I-10, the pavement runoff either sheet flows into the adjacent fields, drains into the Existing FCDMC Regional Detention Basins, ponds on ADOT R/W, or is collected by small roadway swales and conveyed to one of the offsite systems described under item 2. Along the south side of I-10, the pavement runoff either sheet flows into adjacent fields, ponds on ADOT R/W, or is collected by small roadway swales and conveyed to one of the offsite systems described under item 2. Some of the TIs have cross road storm drain systems that some of the I-10 runoff is conveyed to.

IV. Drainage Design Issues Discussed

A. Installing new onsite retention basins

1. The Stage II Plans (30%) depict future retention basins along the south side of I-10 between 6802+00 and 6825+00. URS stated that these basins should be constructed with this project because of the increased pavement runoff and the lack of an appropriate outfall, such as offsite drainage systems or natural washes. Furthermore, additional small retention basins will need to be installed at strategic locations along the project.

2. ***ADOT agreed*** that the project should install retention basins as necessary to maintain the peak runoff at current levels. The current sheet flow or concentrated runoff onto the adjacent private lands is still allowed as long as there is no substantial increase in peak runoff. For example, there is a need for a small retention basin in the southwest quadrant of the Estrella Parkway TI, because adjacent private development blocks overland flow to the south.

3. During a recent field review, URS observed that desert trees have recently been installed in the area of the future retention basins. This was evident through soil disturbance around the base of the trees and an existing working irrigation system. The proposed retention basins would meander around some of the trees, but some of the trees would need to be removed/relocated.

B. **Drainage of Retention Basins**

1. These basins would be drained by percolation into the soil. Every effort would be made not to use drywells. Drainage systems along I-10 already include retention basins that drain through percolation into the soil. Some of them were not constructed as retention basins, but are simply low areas within the R/W along I-10 that function as basins. A field review identified that the infield area of the northeast ramp at the Estrella Parkway TI is depressed, has no outlet, and therefore functions as a retention basin. The infield areas of the four ramps at the Bullard Avenue TI are currently being constructed as retention basins without outlets.

C. **Extending New Drainage Pipes into Flood Control District of Maricopa County (FCDMC) Facilities**

1. The widening project includes the installation of outside curb & gutter, which will require the installation of numerous stub storm drains (similar to downdrains) to capture and convey the pavement runoff down the roadway slope. Some of these concentrated runoffs will flow into the FCDMC retention basins located along the north side of I-10. These concentrated flows need to be mitigated to prevent the creation of severe bank erosion.
2. Severe bank erosion already exists at a few locations along the retention basin bank/I-10 interfaces. These have been created by concentrated flow. This is caused by sheet flow runoff from the roadway embankment accumulating behind a 1-foot high row of dirt located along the ADOT R/W fence, breaking through the dirt row at a low point, and flowing down the retention basin bank at a single location.
3. Some of these downdrain type storm drains will be constructed with the current I-10 median widening project. These storm drains discharge within the ADOT R/W into spreader ditches to try and spread the runoff before it flows down the retention basin banks. This is considered a temporary solution.
4. URS recommended that the ultimate solution is to extend these storm-drains into the FCDMC retention basins. The discharge points would be located at or near the bottom of the basins. ***ADOT drainage agreed with this concept.***
5. One or more outfalls will also need to be punched through a FCDMC concrete channel wall at the Litchfield Road TI.
6. Implementation of this concept will require the acquisition of drainage easements for the construction and maintenance of these facilities.

D. **Continuing Current Drainage System in the Northwest Quadrant of the Estrella Parkway TI**

1. Runoff from the ADOT R/W currently drains to a retention basin located on private land. This basin was most likely constructed with improvement of

Estrella Parkway to an urban section just north of the ramp terminus. A scupper on Estrella Parkway also drains into the ADOT R/W and then into this basin. Flow into the basin is through a pipe that begins with a concrete headwall on ADOT R/W and ends with an outlet at the bottom of the private retention basin.

2. URS is proposing that the redesigned ADOT drainage system continue to be discharged to this retention basin. There is no other viable outfall for this runoff. The increased I-10 pavement could increase the runoff to this basin.
3. ***ADOT agreed*** that the concept should be continued with the concurrence of the City of Goodyear.

E. **Connecting to Existing Cross Street Drainage Systems**

1. ADOT currently directs water to some of the cross street drainage systems, such as at Litchfield Road. Some of these flows may increase due to increased pavement.
2. ***It was agreed*** that URS should evaluate these increases to make sure that the existing system is not overloaded.

F. **Additional Issues**

1. ADOT expressed a concern about embankment slope rilling due to increased pavement runoff along I-10 roadway segments without outside curb & gutter or half barrier. URS stated that the installation of wattles along the embankment fill slopes should minimize the bank erosion until the installation of curb & gutter or half barrier with another future outside widening project. In the meantime, some maintenance of the embankment slopes will be necessary.

VIII. Next Meeting

ADOT Drainage will have a representative at the regular monthly progress meetings. The next one is scheduled for February 7, 2008.

IX. New Action Items – Several items were identified as requiring further action:

1. Bill Dehn will alert Merrisa Marin, ADOT R/W Group that this project will require drainage easements to construct and maintain drainage outfalls into FCDMC facilities located along the north side of I-10.
2. Dave Schaub will arrange a meeting with the City of Goodyear to discuss the continued use of the private retention basin located in the northwest quadrant of the Estrella Parkway TI and the continued use of existing street drainage systems.

cc: Project Distribution List, Meeting Attendees

FINAL DESIGN DRAINAGE MEETING
Design of I-10 Outside Widening
Sarival Avenue to Dysart Road
TRACS No. 010 MA 125 H7296 01 C

January 16, 2008 @ 9:00 AM
ADOT Roadway Design Conference Room
1st Floor Engineering Building

AGENDA

I. Welcome and Introductions

II. I-10 Outside Widening Design Schedule

a. Proposed Design Schedule

Stage III Submittal	29 Feb 2008
Stage IV Submittal	19 Jun 2008
Stage V Submittal	29 Aug 2008
Bid Advertisement	09 Mar 2009

III. Overall Drainage Design

a. Offsite

b. Onsite

IV. Drainage Design Issues

a. Installing new onsite retention basins

i. Future retention basins were depicted on the 30% plans

ii. Drainage of retention basins

b. Extending new drainage pipes into Maricopa County Flood Control District's facilities

i. Bank erosion control issue

ii. ADOT/FCDMC agreement required

c. Continuing current drainage system in Northwest quadrant of the Estrella Pkwy TI

i. Runoff from ADOT R/W currently drains to retention basin located on private land

ii. Propose that redesigned ADOT drainage system would discharge to this basin

iii. ADOT should get concurrence from the City of Goodyear

d. Connecting to existing cross street drainage systems

V. Additional Actions Required

Drainage Meeting Attendance
Final Design for Interstate 10 - Sarival Avenue to Dysart Road (H6878)

January 16, 2008 @ 9:00 AM
ADOT Roadway Design Conference Room

Attend (Initial)	Name	Title/Department	Company /Agency Represented	Address	Phone	Fax	E-mail Address
	Arizona Department of Transportation						
	Mike Bruder	Valley Project Management, EM01	ADOT	1611 W. Jackson Street, MD EM01 Phoenix, AZ 85007	602-712-6836	602-712-7630	MBruder@azdot.gov
SH	Stephanie Huang	Valley Project Management, EM01	ADOT	1611 W. Jackson Street, MD EM01 Phoenix, AZ 85007	602-712-8695	602-712-7630	SHuang@azdot.gov
	Adam Carreon	VPM / T.E.S.	ADOT	1611 W. Jackson Street, MD EM01 Phoenix, AZ 85007	602-316-4594	602-712-7630	ACarreon@azdot.gov
	Ade Ashaye	Valley Project Management, EM01	ADOT	1611 W. Jackson Street, MD EM01 Phoenix, AZ 85007		602-712-7630	AAshaye@azdot.gov
	Alex Arriaga	Phoenix Construction District, E700	ADOT	4550 N. Black Canyon Hwy Phoenix, AZ 85017	602-712-6670	602-712-3116	aarriaga@azdot.gov
	Barry Crockett	Contracts & Specifications, 121F	ADOT	1651 W. Jackson St, MD 121F Phoenix, AZ 85007	602-712-7221	602-712-3051	bcrockett@azdot.gov
	Bill Major	Trans. Maintenance Analyst 1	ADOT	2104 S. 22nd Ave., MD 013R Phoenix, AZ 85009	602-712-6793	602-712-3305	bmajor@azdot.gov
	Dale Drost	Phoenix Maintenance District, PM00	ADOT	2140 W. Hilton Avenue Phoenix, Arizona 85009-3740	602-712-8395	602-712-3108	ddrost@azdot.gov
	Dennis Crandall	Drainage Group, 634E	ADOT	205 S. 17th Ave, MD 634E Phoenix, AZ 85007	602-712-7197	602-712-3161	dcrandall@azdot.gov
	Ed Green	Environmental Planning Group Haz-Mat	ADOT	205 S. 17th Ave, MD 613E Phoenix, AZ 85007	602-712-7114	602-712-3066	EGreen@azdot.gov
	Floyd Roehrich	Valley Project Management, EM01	ADOT	1611 W. Jackson Street, MD EM01 Phoenix, AZ 85007	602-712-7559	602-712-7630	FRoehrich@azdot.gov
	George Chin	Phoenix Regional Traffic	ADOT	2140 W. Hilton Phoenix, AZ			GChin@azdot.gov
	James Hampshire	Phoenix Construction District, E700	ADOT	4550 N. Black Canyon Hwy Phoenix, AZ 85017	602-712-7387	602-712-3116	JHampshire@azdot.gov
	James Wilson	Materials Group, Geotechnical Design Section, 068R	ADOT	1221 21st Ave, MD 068R Phoenix, AZ 85007			jwilson2@azdot.gov
	Javed Bari	Materials Group, Pavement Design	ADOT	1221 21st Ave, MD 068R Phoenix, AZ 85007	602-712-7244	602-712-8138	jbari@azdot.gov
	Joe Salazar	Roadside Development, 617E	ADOT	1611 W. Jackson Street, Phoenix, AZ 85007			jsalazar@azdot.gov
	Kamal Mirtalaei	Utility & Railroad Engineering, 618E	ADOT	205 S. 17th Ave, MD 618E Phoenix, AZ 85007	602-712-7643	602-712-3229	smirtalaei@azdot.gov
KA	Ken Akoh-Arrey	Drainage Design Section	ADOT	205 S. 17th Ave, MD 634E Phoenix, AZ 85007	602-712-8660	602-712-3131	Kakoh-Arrey@azdot.gov
	Leroy Brady	Roadside Development, 617E	ADOT	205 S. 17th Ave, MD 617E Phoenix, AZ 85007	602-712-7357	602-712-3217	lbrady@azdot.gov
	Lev Derzhavets	Roadway Design, 615E	ADOT	205 S. 17th Ave, MD 615E Phoenix, AZ 85007	602-712-6733	602-712-6335	lderzhavets@azdot.gov

Drainage Meeting Attendance

Final Design for Interstate 10 - Sarival Avenue to Dysart Road (H6878)

January 16, 2008 @ 9:00 AM

ADOT Roadway Design Conference Room

Attend (Initial)	*Name*	*Title/Department*	*Company /Agency Represented*	*Address*	*Phone*	*Fax*	*E-mail Address*
	Madhav Mundle	Agua Fria Field Office Phoenix Construction District, E748	ADOT	4550 N. Black Canyon Hwy Phoenix, AZ 85017	602-768-4483	602-712-3116	mmundle@azdot.gov
	Matt Burdick	Communication & Community Partnerships, 118A	ADOT	206 S. 17th Ave, MD 118A Phoenix, AZ 85007	602-712-7049	602-712-7855	mburdick@azdot.gov
	Merrisa Marin	Right of Way Group	ADOT	205 S. 17th Ave, MD 612E Phoenix, AZ 85007	602 712-6341	602-712-3051	mmarin@azdot.gov
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Drainage Meeting Attendance
Final Design for Interstate 10 - Sarival Avenue to Dysart Road (H6878)

January 16, 2008 @ 9:00 AM
ADOT Roadway Design Conference Room

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Drainage Meeting Attendance

Final Design for Interstate 10 - Sarival Avenue to Dysart Road (H6878)

January 16, 2008 @ 9:00 AM

ADOT Roadway Design Conference Room

Attend (Initial)	*Name*	*Title/Department*	*Company /Agency Represented*	*Address*	*Phone*	*Fax*	*E-mail Address*
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Drainage Meeting Attendance
Final Design for Interstate 10 - Sarival Avenue to Dysart Road (H6878)

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Attend (Initial)	*Name*	*Title/Department*	*Company /Agency Represented*	*Address*	*Phone*	*Fax*	*E-mail Address*
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